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No. 29 for the year 1949.

BRITISH MUSEUM NATURAL HISTORY

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Editorial.

MEMBERS will notice some changes in the appearance and contents of this year's *London Naturalist.* The most revolutionary of these is the disappearance of the list of members. With the increasing size of the Society the list of members has occupied a progressively larger proportion of our space, until last year it took just over one-eighth of the 160 pages. In the interests of economy, and in order to release extra space for more valuable and more interesting material, Council has decided that the list of members shall be printed only every third year. During the intervening years only lists of new members will be published, but the Secretary will supply all sectional secretaries and officials of the Society with supplementary lists from time to time, so as to enable them to keep their lists up to date.

The legend that appears on the spine of this issue has also been changed. Confusion has been caused in the past by the fact that the *London Naturalist* for 1949 is published in 1950. This makes it difficult, in referring to articles, to decide whether to refer to the year of publication or to the year covered by the report. In order to avoid this confusion, the *London Naturalist* for 1944 and all subsequent issues have been allotted numbers, and these numbers should be used in all references. In future these numbers will also appear on the spine. References to articles by named authors should, in order to comply with British Standard 1629 : 1950 (Bibliographical References), be made in the following form if the article was published in the *London Naturalist* for 1944 or any later year: " FITTER, R. S. R., 1949. Check-list of the Mammals, Reptiles and Amphibia of the London Area, 1900-1949. *London Naturalist,* No. 28, pp. 98-115." References to earlier issues should take the form " *London Naturalist* for 1942 " and the date of priority, which follows the author's name, should be the year of publication.

The present issue maintains the variety of interest which is characteristic of the *London Naturalist.* We are particularly glad to publish what will no doubt be the first of a series of reports on the temporary sections by the Geological Section, which provides evidence of the valuable work being done by members of the Society in that field. Other sections also are increasingly active, and for the first time in the Editor's tenure of office it has been found impossible to publish all the papers that were submitted. This was partly accounted for by the length of some of the papers that have been accepted, but it is none the less a healthy sign of the vigour of the Society.

All papers intended for publication in the *London Naturalist* should be submitted in the first place to the Secretary of the appropriate section and not to the Editor. It would assist the Editor in his efforts to achieve earlier publication if sectional Secretaries and intending contributors would aim at completing at least the first draft of their papers by the end of the year.

Tothill Fields, Westminster: A Lost Botanical Area.

By Douglas H. Kent.

TOTHILL Fields consisted of a large tract of land sloping to the Thames to the south of Westminster Abbey. In medieval times the fields probably stretched westwards to join the meadows of Pimlico and Chelsea, while to the north lay St James's Park and Rosamond's Pond, a rectangular pool lying across what is now Birdcage Walk (2). A branch of the Tyburn flowed across the open fields to enter the Thames near the present-day Vauxhall Bridge Road (7). The lower parts of the fields near the Thames were apparently intersected by numerous ditches and the area was of a very marshy nature, while the upper parts appear to have consisted of a dry sandy soil.

The citizens of Westminster spent much of their leisure in the fields, and butts were erected before 1517 (1). Tournaments and fairs were held, and a part of the area became a duelling ground (32). Building commenced on the northern parts of the fields about the middle of the sixteenth century, and during the reign of Elizabeth there were houses on both sides of Tothill Street (2).

The first of the early botanists to record plants from the district was John Gerarde, a Barber-Surgeon of Holborn, who in 1597 reported "*Cornu cervinum* (*Plantago Coronopus* L.) and *Coronopus Ruellii* (*Coronopus procumbens* Gilib.) . . . in Touthill fields neere unto Westminster" (9). In 1622 a House of Correction called the Bridewell was erected in the fields, and was used as a prison until 1836, when it was demolished (1). The next botanist to pay attention to the area was Thomas Johnson, an apothecary of Snow Hill, who in 1633 recorded "*Lysimachia galericulata* (*Scutellaria galericulata* L.), *Conyza media* (*Pulicaria dysenterica* (L.) Bernh.), *Alsine Spergulae facie* (*Spergularia rubra* (L.) J. et C. Presl.) and *Percipier Anglorum* (*Alchemilla arvensis* (L.) Scop.) . . . in Tuthill-fields, nigh Westminster" (17). By this time the area of the fields had been further diminished by the construction of the Neat Houses in the west and the consequent enclosure of the Neat House Gardens. The western boundary now stood approximately on the line of the present Vauxhall Bridge Road, while on the north-west side Rochester Row had come into being.

William How, a medical man, visited the area about 1650 and noticed "*Juncus caule triangulari* (*Scirpus triqueter* L.) by ye Horseferry" (14). Upon the outbreak of the plague in 1665 a number of pest houses were built on the fields, and as the number of deaths increased plague pits were constructed in the area; Samuel Pepys writes, "18 July 1665, I was much troubled this day to hear at Westminster how the officers do bury the dead in the open Tuttle Fields, pretending want of room elsewhere" (20). Christopher Merrett, a physician of Hatton Garden, was the next author to mention the fields, and in 1666 he recorded "*Anagallis aquatica quarta* (*Veronica scutellata* L.) and *Chamaemelum nudum odoratum* (*Anthemis nobilis* L.) in Tuthil fields" (18); he also noticed a grass "*Gr. Paniceum sylv. spica divisa* (*Echinochloa Crus-galli* Beauv.) in a lane by the Neat House Gardens" (18).

Towards the end of the seventeenth century the fields appear to have been frequently visited by that eminent trio of London botanists—Samuel Doody, James Petiver and Adam Buddle. In 1690, Doody, an apothecary in the Strand, recorded "*Trifolium siliquis ornithopodii* (*Trigonella ornithopodiodes* (L.) DC.) in Tuthill fields" (25). Five years later Petiver, an apothecary of Aldersgate Street, noted "*Persicaria pusilla repens* (*Polygonum minus* Huds.) and *Trifolium pumilum supinum flosculis longis albis* (*Trifolium subterraneum* L.) . . . these . . . plants I have often found in Tuttle-fields, Westminster" (21). He also collected *Chenopodium glaucum* L. "plentifully just going into Tothill Fields near the road next Westminster," and *Veronica Anagallis-aquatica* L. "by the Thames near Peterboro' House" (13). The latter place stood on the site of the present-day Millbank. Petiver also recorded "*Gramen Dactylon latiore folio* (*Digitaria sanguinalis* (L.) Scop.) upon the Thames bank about the Neat-houses" (21). Buddle, a priest of Hampstead, added "*Trifolium lupulinum minimum*" (*Trifolium filiforme* L.) to the known flora of the fields (5). He also gathered *Heliocharis palustris* (L.) Roem. et Schult. . . . "in ye River Thames near Peterborow House" (13). About 1700, Isaac Rand, an apothecary practising in the Haymarket, discovered *Rumex palustris* Sm. (22) and *Mentha Pulegium* L. growing in the marshy parts of Tothill Fields (12).

During the early part of the eighteenth century a bear garden was held in the fields; a maze was also constructed for the amusement of the citizens (32). For a number of years the area appears to have been neglected by the London botanists, but about 1721 Joseph Andrews, an apothecary of Sudbury, Suffolk, and John Field, an apothecary of Newgate Street, gathered *Trifolium squamosum* L. "by the Thames side near the Earl of Peterborough's Palace" (12). The third edition of Ray's *Synopsis*, published in 1724, contained a number of records for the area, but no additional plants were noted. About 1736 John Blackstone, a young apothecary practising in Fleet Street, noticed *Ranunculus circinatus* Sibth. "in the ditches in Tothill Fields" (3), and ten years later he recorded "*Eruca aquatica* (*Rorippa sylvestris* (L.) Besser) and *Sagitta aquatica major et minor* (*Sagittaria sagittifolia* L.) . . . plentifully in the ditches in Tuthill-Fields, Westminster" (4). William Hudson, another London apothecary, was the next author to publish on the vegetation of the fields, recording in 1762 the continued existence of *Polygonum minus* Huds. there (15), and in 1778 noting *Polygonum Hydropiper* L. in the ditches (16). About this time a careful and detailed examination of the flora was made by John Lightfoot and William Curtis. Lightfoot, Curate of Uxbridge, Middlesex, collected *Rorippa sylvestris* (L.) Besser—"very abundant there"—*R.*

amphibia (L.) Besser and *Chenopodium glaucum* L. (1), while Curtis, an apothecary and owner of a Botanic Garden, recorded *Polygonum minus* Huds. . . . " in the greatest abundance in the watery parts of these fields," *Trifolium ornithopodioides* (*Trigonella ornithopodioides* (L.) DC.), plentifully, and *Sisymbrium terrestre* (*Rorippa islandica* (Oeder) Borbás) (6). In 1789 Edward Forster, a keen amateur botanist, noted *Petroselinum segetum* (L.) Koch and *Matricaria Chamomilla* L. in the fields and *Aegopodium Podagraria* L. near the Horseferry (8). He also collected *Apium nodiflorum* (L.) Lag. var. *pseudo-repens* (H. C. Wats.) Druce in the marshy parts of Tothill Fields (12), and *Scirpus triqueter* L. at Millbank (10). Colin Milne and Alexander Gordon were the next to pay attention to the district, and in 1793 they noted *Valeriana Sambucifolia* Mikan. in Tothill Fields and at Millbank, and *Smyrnium Olusatrum* L., *Oenanthe aquatica* (L.) Poir. and *Catabrosa aquatica* (L.) Beauv. also by the Thames at the latter place (19). About the same time Sir J. E. Smith gathered *Ranunculus hederaceus* L. in the marshy parts of the fields (28), and James Sowerby, the botanical artist, noted *Zannichellia palustris* L. in the ditches (29).

In the latter part of the eighteenth century a portion of the fields was apparently turned over to cultivation; this resulted in the introduction of a number of weeds, and in 1805 Joseph Woods recorded *Thlaspi arvense* L. there (31). About 1810 building began on Tothill Fields, and a large area was lost by the inclosure of Vincent Square (32). A considerable portion, however, remained, and between 1820 and 1825 *Hydrocharis Morsus-Ranae* L. still grew in the ditches near the Thames (30). In 1830, Robert Hardwicke, the publisher, gathered *Erigeron canadensis* L. in the fields (30). About 1835 building began in earnest, and by about 1850 Tothill Fields had been buried under a deluge of bricks and mortar. It is just possible that the Westminster School Playing Field in Vincent Square is a part of the original fields, though there is little hope of any of the more interesting plants having survived.

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Herniaria glabra L. in Middlesex.

By Douglas H. Kent.

In December 1948 Mr E. B. Bangerter drew my attention to a specimen of *Herniaria glabra* L. collected on a disused car park at Kenton, Middlesex, by Mr Arthur J. Potts in 1943. The plant had been sent to Mr W. R. Sherrin, the Curator of the South London Botanical Institute, for determination; and had later been forwarded to the herbarium at the British Museum (Natural History).

Mr Potts was kind enough to provide me with details of the precise locality where the species grew, and in July 1949 I visited the spot and saw hundreds of fine plants scattered over an area of about half an acre. The plant is not native at Kenton, and was possibly introduced during the early part of the recent war. It is now, however, well established, and should persist, although it has been stated that there is a possibility of the car park being asphalted over

Herniaria glabra is an extremely rare adventive in the London area, and has been recorded as follows:—

V.-c. 16, West Kent. "In the first field leading from the London road to Swanscombe, opposite the Marshes"; *M. & G.*, I, 454, 1793. "We suspect that this was an error; at any rate, it lacks confirmation"; *H. & M.*, 289, 1899. Near Bexley, J. Taylor, *B.E.C. 1926 Rep.*, 129 (1927).

V.-c. 21, Middlesex. "In meadows at Colney Hatch; *Huds.*, i, 94, 1762. "We found it in a field at Finchley, and likewise at Colney Hatch"; *M. & G.*, I, 455, 1793. Finchley Common, 1795, Mr Dickson teste C. C. Babington; *E.B.S.*, iii, 2857. "Ex Horto proprio, evenit ex humo ab Ealing Common, 21 June 1817," specimen in Dr Burchell's herbarium at Kew, *teste* J. Britten; *Journ. Bot.*, 271, 1871. This is an error, the specimen at Kew being *Herniaria cinerea* Lam. et DC., an adventive from Europe. "I possess a sp. localised from 'Harefield, Midd. Coll. G. Browner, 1875,' but can find no record of the station," Arthur Bennett; *Trans. Norf. & Norw. Nat. Soc.*, VIII, pt. IV, 528-534, 1908.

In Britain, *Herniaria glabra* is probably native in bare calcareous and sandy places in a few East Anglian counties; elsewhere it is regarded as an introduction. The recorded vice-comital distribution for the British Isles is as follows:—V.-c. 1, West Cornwall (errors for *H. ciliata* Bab.); v.-c. 3, South Devon (errors for *H. hirsuta* L.); v.-c. 6, North Somerset (adventive); v.-c. 11, South Hants. (error?); v.-c. 13 or 14, West or East Sussex (adventive); v.-c. 16, West Kent (adventive); v.-c. 21, Middlesex; v.-c. 25, East Suffolk (error?); v.-c. 26, West Suffolk; v.-c. 27, East Norfolk; v.-c. 28, West Norfolk; v.-c. 29, Cambridge; v.-c. 31, Hunts; v.-c. 41, Glamorgan (adventive); v.-c. 53, South Lincoln; v.-c. 54, North Lincoln; v.-c. 56, Nottingham; v.-c. 59, South Lancs.; v.-c. 64, Mid-West York (colonist); v.-c. 70, Cumberland; v.-c. 81, Berwick; v.-c. 88, Mid-Perth (alien); Channel Islands (errors for *H. ciliata* Bab.). Ireland: H.1 or H.2, North or South Kerry.

In conclusion, I wish to offer my sincere thanks to Messrs E. B. Bangerter and J. E. Lousley for assistance in compiling this paper.

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Botanical Records for 1949.

Compiled by J. Edward Lousley.

The weather of 1949 provided ideal conditions for out-of-doors activities but its effect on plants was less satisfactory. From spring to autumn, rainfall was exceptionally low and the difficulties with which plants had to contend were aggravated by deficiencies in precipitation during the previous winter and preceding years, which had already reduced the water-content of the ground. But for the absence of periods of extreme heat the effects would have been much more serious than they were.

Annuals did not germinate freely and were scarce with the exception of species growing on pond and lake margins which profited from the exceptionally extensive stretches of exposed mud. A particularly pleasing example of this occurred outside our area at Shalford, Surrey, where *Cyperus fuscus* was in much greater quantity and extended over more of the pond than in any previous year during my quarter of a century's experience of this locality. Low water levels also permitted investigation of places not usually accessible. Over long stretches of the Basingstoke Canal it was possible to walk in the bed of the canal dryshod and thus examine the banks. The low level of the Thames permitted similar work in places, while it was easy to get round nearly the whole of the Brent Reservoir.

Although the plants of the London Area often suffered severely from drought the evidence in general was far less distressing than in some other parts of the country. Nowhere in our Area did I see sights comparable to the almost desert conditions of the Cotswolds or the extreme wilting of water-loving alpines on certain Scotch mountain cliffs. The most serious effect of the lack of rainfall on our records is seen in the paucity of observations of annual aliens and this is not a matter of great importance.

The following records are arranged in sequence of Watsonian vice-counties:—

V.-c. 16, West Kent.

In July 1947 I was botanising on Stone Marshes with J. A. Whellan and collected a grass which was suspected to be *Puccinellia pseudo-distans* (Crép.) Jansen & Wachter—a determination which was confirmed by Dr Jansen this autumn. The species is intermediate in appearance between *P. fasciculata* Bickn. (*Glyceria Borreri* Bab.) and *P. distans* (L.) Parl. (*G. distans* (L.) Wahl.) and might at first sight be taken for a robust example of the latter which was collected with it on the same day near Littlebrook Farm. *P. pseudo-distans* is described and illustrated in my paper in the *Journal of Botany* (*74*, 260-266, 1936) and has previously only been found in Britain at Seasalter, v.-c. 15, and Grain, v.-c. 16.

In August this year Mrs W. I. Brewer sent a record for *Centaurea solstitialis* L. from a lucerne field near Hartley Church, Longfield, where it was subsequently seen by several other members. The locality is about a mile outside our boundary. This yellow-flowered Knapweed has a well-established place in our Floras but is an alien which seldom persists for more than a single season and is dependent on repeated re-introduction with lucerne seed from the Mediterranean region. Another pleasing Kent alien is Canterbury Bells, *Campanula Medium* L., which is thoroughly established for over a mile on chalk railway cuttings between Eynsford and Shoreham and also on the Rochester line near Meopham. I had known it in both places for many years but it was only in June this year that I was able to examine a colony near Shoreham at close quarters, when I found that it was accompanied by Sweet William, *Dianthus barbatus* L., equally self-seeded and likely to be persistent.

The field dressed with shoddy which produced so many aliens of Australian origin in the late autumn of 1948 (*L.N., No. 28*, 27) has been kept under observation by D. McClintock, myself and other botanists. No new species were seen and many of those recorded in 1948 did not occur again. *Erodium cygnorum* Nees, *E. moschatum* (L.) Ait., and *E. Botrys* (Cav.) Bert. were plentiful and there were also variants of the second-named species and of the native *E. cicutarium* L'Herit. with very finely dissected leaves. *Medicago minima* (L.) Bartol. and *M. hispida* Gaertn. were abundant and *M. laciniata* (L.) Miller fairly plentiful. A single plant of *Xanthium spinosum* L. was observed. Cultural experiments with the shoddy given ample moisture yielded an abundance of Medicks but no other plants. These observations suggest that the grasses (of which seeds were still numerous in the shoddy in the field) and *Compositae* found in 1948 had ceased to be viable by 1949 whereas the Leguminosae (a long-lived seed group) still germinated freely as did the *Erodia*. Further tests of the shoddy will be made next year but in the meantime it seems likely that in the material used to dress the field last season too long an interval has elapsed since the wool left the sheeps' backs in South Australia for a wide range of plants to appear.

V.-c. 17, SURREY.

The well-known locality where the famous economist John Stuart Mill discovered *Lilium Martagon* L. at Headley in 1826 is now protected and it is pleasing to record that well-planned thinning of the copse has been followed by an increased flowering of this handsome plant. Even more pleasing is J. E. S. Dallas' discovery in 1947 of a colony in a wood about half a mile away to which he conducted me last June. Some ten years ago I searched this place carefully because an old record which I cannot now trace indicated that at least one botanist had found the Martagon Lily at Headley on the opposite side of the valley from Mill's spot. If any reader comes across this record I should be glad to have the reference.

Teucrium Botrys L. is another special Surrey rarity and in addition to the " wild stony locality . . . at the back of Box Hill " where it was first recorded for Britain in 1844 it occurs occasionally on other parts of the hill. Mr Dallas noted it in 1948 above the Burford Bridge Hotel but this is a little beyond the boundary of our Area. In 1925 I found *Potentilla recta* L. on a wall in Headley Lane and S. A. Chambers told me that he had seen it there 30 years earlier—there is an undated record in Salmon's *Flora of Surrey.* After a time it disappeared and several searches during the last decade have been unsuccessful. It was therefore with surprise that I saw it again in June this year back in exactly the old place. A few yards away there was *Lonicera Caprifolium* L. in a hedge which I have known for about the same period but often failed to refind amongst the other hedgerow vegetation.

Miss E. M. C. Isherwood sent me specimens of *Cynodon Dactylon* (L.) Pers. from the corner of Babylon Lane, Kingswood. It is remarkable that another locality for this rare grass should be found so soon after its discovery on Barnes Common (*L.N., No. 28,* 28). R. A. Boniface sends an interesting list of his finds during the year, including *Artemisia Verlotorum* Lam. as abundant on waste ground by the river at Walton-on-Thames, and *Panicum laevifolium* Hack. (named by C. E. Hubbard) from a sandy waste field ploughed out of West End Common, Esher. On Wimbledon Common he found 6 plants of *Cynoglossum officinale* L. Although this was a well-known locality for the plant a century ago—it was figured for *English Botany* from here—the only recent record for the Common seems to be one made by C. Avery, who collected it as a " casual " in 1936.

Mrs B. Welch found a plant of *Trifolium agrarium* L. in Martyr's Lane, N.E. of Woking. This Trefoil is fairly frequent in Scotland but seldom seen in the south. She noted *Thalictrum flavum* L. near the Thames Conservancy obelisk at Ham and *Smyrnium perfoliatum* Mill. from " under bushes, Kew Road, Richmond, opposite Stanmore Road." The latter is persistent at Burton Court, Chelsea, Middlesex. She also found the uncommon form of *Solanum Dulcamara* L. with white flowers in Battersea Park in a spot which must be very close to the " Lane from high road to Battersea fields (from the Bridge) " where T. Moore (1821-1887) collected a specimen now in the Natural History Museum herbarium. Mrs L. M. P. Small records *Scutellaria minor* Huds. from a ditch in Richmond Park near Ham Gate.

In September I went to Ivy Millpond, Godstone, to see the immense quantities of *Rumex maritimus* L. reported by C. D. Pigott. A plant or two of Golden Dock appears there in most seasons but this year the dry (perhaps drained) bed of the pond was choked with it. Hybrids with *R. conglomeratus* were also collected. On the same day I found *Geranium pratense* L. in a lane between Rectory Pond and Leigh Millpond, Godstone, and *Mentha longifolia* (L.) Huds. in a sandpit at Tilburstow Hill.

The " Craterful of Aliens " (as it was called in an article in *The Times* of June 7, 1949) on Brockham Hill was visited by a considerable number of botanists during the summer but no additional species were observed. *Echinops sphaerocephalus* L. occurs on the down as well as in the crater and with an Evening Primrose, *Oenothera sp.*, and Fennel, *Foeniculum vulgare* Mill., was omitted from my list in last year's records. One species still remains to be identified. Of the plants listed in 1948 only *Diplotaxis erucoides*, *Lunaria rediviva*, and *Leonurus Cardiaca* were not actually seen by me this year. It would seem that P. Greenfield was the first botanist to observe the plants of this bomb crater in June 1945 when there was also a *Hyoscyamus* (species not stated).

Most members will already be aware that the Basingstoke Canal has changed hands twice during the last year, and that a large L.C.C. estate is planned between Woking and Byfleet to cover Sheerwater Bog. Although outside our Area this stretch of country is of exceptional interest to London naturalists and now that its destruction seems inevitable a special effort should be made to record the flora (and fauna) before it is lost. The Society was well represented on the visit made by the *Botanical Society of the British Isles* on September 17th for this purpose. The results of this investigation will be published elsewhere but mention must be made of the variations of the Horsetail, ×*Equisetum litorale* Kühl, which were found along a limited part of the canal. Earlier in the summer Mrs Welch found *Lemna minor* L. in flower there, and later reported *Calamagrostis epigeios* (L.) Roth from near Sheerwater Bog, where R. A. Boniface had it in 1948.

The Field Ladies' Mantle, *Alchemilla arvensis* (L.) Scop., has been shown by S. M. Walters to include two species hitherto confused in Britain. An abstract of his paper in which he justifies the separation of these annual plants from the perennial species of *Alchemilla* into a separate genus *Aphanes* is given on page 21. Both species occur in Surrey (and elsewhere in our Area) and Walters has confirmed material in my herbarium from Warlingham and Selsdon which I collected in 1923 and 1926 respectively as *Aphanes arvensis* L., and specimens collected by me from Esher in 1931 and by F. A. Swain from near Spring Park Woods, West Wickham (just in Surrey) in 1927 as *Aphanes microcarpa* (Boiss. & Reut.) Rothm.

V.-c. 18, SOUTH ESSEX.

It is satisfactory to be able to include a number of excellent records for a county which our members have neglected in recent years. On September 9th, B. T. Ward conducted a party from the Society to a private chalk-pit near Grays, where he showed us *Pyrola rotundifolia* L. which had been found the previous year. This lovely plant is new to the records of the London Area and an important " N.C.R." It was still in flower at the time of our visit though it was too late to show us the Man Orchid, *Aceras anthropophorum* (L.) Br., which he had found there earlier in the season and of which there are no recent records from Essex. He also conducted us to the Adder's Tongue Fern, *Ophioglossum vulgatum* L., and to bird-sown bushes of *Pyracantha coccinea* Roemer (*Crataegus Pyracantha* Med.). It was interesting to see such chalk plants as *Blackstonia perfoliata* (L.) Huds. and *Gentiana axillaris* (Schmidt) Rchb. in South Essex. The party were also fortunate in finding *Bunias orientalis* L., *Lotus tenuis* Willd. (with a form with smaller deep red flowers as well as plants with the normal yellow blooms) and *Poa compressa* L. in the pit. In an adjoining sandy field *Medicago varia* Martyn was collected. This is now believed to be a fertile hybrid between *M. falcata* L. and *M. sativa* L. It is better known in this country as *M. sylvestris* Fries and is plentiful in limited sandy areas in Norfolk and Suffolk but rare elsewhere.

After tea in Grays most of the party returned home but I walked with Mrs B. Welch along the riverside to Stone Ness and back to the main road near West Thurrock. A considerable area of the marshes has been filled in with dumped material which has long consolidated and the only interesting plants are a few persistent aliens such as the Grape-vine, *Vitis vinifera* L. and *Euphorbia virgata* Waldst. & Kit., which are able to compete with native vegetation. On the Grays side of the dumped area, *Bupleurum tenuissimum* L. was plentiful on the river wall, and *Calamintha nepeta* (L.) Savi seen on a bank.

Near Stone Ness we found a most excellent salt-marsh which has probably no equal nearer the metropolis. Species noticed in and near the marsh included *Apium graveolens* L., *Aster Tripolium* L. (both rayed and discoid ("var. *discoideus* Rchb.")), *Plantago maritima* L., *Atriplex littoralis* L., *Juncus Gerardi* Lois., *J. maritimus* Lam., *Triglochin maritima* L., and *Spartina Townsendii* H. & J. Groves. This area deserves further investigation earlier in the season.

V.-c. 21, **Middlesex.**

This county has again been the subject of much careful investigation by D. H. Kent. In June he discovered *Chara contraria* Kuetz and *Potamogeton Friesii* Rupr. in the Long Water in Hampton Court Home Park. The former is a very scarce Stonewort for which the only previous records from within our Area were from Surrey and the most recent of these nearly 40 years ago. A paper written by Kent describing the discovery of *Herniaria glabra* L. at Kenton and its distribution in Britain appears elsewhere in this *London Naturalist*. In the lake at Town Park, Enfield, he found four Duckweeds, *Lemna polyrhiza* L., *L. trisulca* L., *L. minor* L., and *L. gibba* L., and notes *Zannichellia palustris* L. with other waterweeds in the Lily Pond close to Bayswater Road, in Kensington Gardens.

On Hounslow Heath Kent found *Galium erectum* Huds. and his records for the year include *Nasturtium microphyllum* (Boenn.) Rchb. The last is one of the two species into which Common Watercress has recently been split on cytological as well as morphological characters.

It was described by Howard and Manton as *N. uniseriatum*, with reference to the arrangement of the seeds in a single row in the pod. The testa of the seeds has about 100 small depressions in each side and the plant is an allotetraploid (2n = 64). The other Watercress is *N. officinale* R. Br. *sensu stricto*, with seeds arranged in a very distinct double row in the shorter, fatter pods. Its seeds have about 25 large depressions in the testa on each side and it is diploid (2n = 32). There are other characters but those given serve for easy identification and are beautifully illustrated in Miss Ross-Craig's *Drawings of British Plants*, Part 3, 1949. Watercress is quite common in the London Area and the assistance of members in working out the distribution of the two species would be welcomed.

A marshy field near Yeading discovered by R. A. Boniface contains a remarkable association of plants suggestive of the inland salt floras such as those near Droitwich and near Marcham, Berkshire. In this field he found *Aster Tripolium* in some quantity growing with *Puccinella distans* (L.) Parl., *Chenopodium rubrum* L., and a fleshy form of *Matricaria inodora* L. The field and district should be searched for early flowering species. Also at Yeading he found a single plant of *Chenopodium hybridum* L.

From a pond near Stanmore Heath Boniface records *Menyanthes trifoliata* L. and *Acorus Calamus* L., and *Luzula sylvatica* (Huds.) Gaud. he noted as abundant in Hendon Park and less plentiful in Scratch Wood. F. Rose saw two plants of the last-mentioned species in Ken Wood. Near Kenwood House L. C. Soper saw *Listera ovata* (L.) Br. in 1945, 1946, and 1947, and H. C. Harris saw six plants here in 1949. This may well be the nearest locality for an orchid to the centre of our area at St Paul's. In an enclosure near Ken Wood House Mr Soper found *Geranium phaeum* L. in 1948. A small patch of *Scirpus maritimus* was seen this year by R. A. Boniface by the Thames at Twickenham.

On the evening visit to Brent Reservoir in September, *Chenopodium glaucum* L. and *Rumex palustris* Sm. were seen in abundance all round the shores. In addition we saw *Chenopodium rubrum* L. in various forms, *C. ficifolium* Sm., *C. polyspermum* L., *Alopecurus aequalis* Sobol, *Ranunculus sceleratus* L., *Stachys palustris* L., and *Polygonum nodosum* Pers. On an earlier visit I had seen *Butomus umbellatus* L. in some quantity in a spot which would not be accessible when the water-level is high. F. E. Wrighton records *Phyllitis Scolopendrium* (L.) Newm. from Highgrove House, Eastcote, and *Asplenium Trichomanes* L. from Ruislip church. P. F. Yeo gives *Petasites fragrans* (Vill.) C. Presl from Hampton Water Works.

Mr Kent has drawn my attention to a paper by G. Ledyard Stebbins, Jnr., and Elton F. Paddock on " The *Solanum nigrum* complex in Pacific North America " in *Madrono, 10,* 70-80, 1949. The authors state that they have seen a photograph of the type specimen of *S. sarachoides* Sendt. ex Mart., *Fl. Bras., 10,* 18, 1846, and that this type was at Berlin (and is therefore probably destroyed). It seems that this is likely to be the earliest name for the plant given as *S. villosum* auct. non Lam. (*L.N., No. 26*, 76) and *S. nitidibaccatum* Bitter (*L.N., No. 27*, 41-42). The account mentioned shows that *S. chenopodioides* Lam. was a mixture of two species and cannot be used for the alien Nightshade which was given under this name in *B.E.C. 1943/4 Rep.*, 684, 1946.

The flora of the City bombed sites is now relatively stabilised and only a few additional species have been observed during the year. Of these perhaps *Carex pendula* L., a plant of clay woods and damp places, is perhaps the most surprising. Two clumps were detected by Mrs B. Welch and D. H. Kent on rubble immediately behind St Olaves', Hart Street. F. E. Wrighton reports a patch of *Medicago falcata* L. immediately north of London Wall near Milton Street. I was interested to see *Lepidium ruderale* L. in quantity on the open pavement of the ruined Dutch Church in Austin Friars—in 1948 it had been shown to us by F. E. Wrighton on the east side of Milton Street. The appearance of Hawkweeds on the bombed sites had long been expected—their wind-borne fruits can be dispersed over considerable distances, and they thrive on well-drained habitats such as those provided by brick rubble. In August 1949 I found the first two plants of a *Hieracium* to be noticed in the City. These were by Red Cross Street and if they get established their colonisation of adjacent sites may well be rapid.

V.-c. 24, Bucks.

The small portion of this vice-county included in our area tends to be neglected and it is a good many years since we last had any records from there. It was partly for this reason that the visit of the Botanical Section to Black Park was planned for July 23rd, when the following were found:—*Hypericum Androsaemum* L., *H. dubium* Leers, *Carex laevigata* Sm., and *C. curta* Good. In 1940 Mrs H. R. Davies discovered *Carex elongata* L. in a ditch in a small wood between Slough and Uxbridge—probably just within our area. The specimens have only recently been identified by E. Nelmes of Kew and represent an important New County Record.

It will be evident from this report that much useful work was done during 1949 and our thanks are due to members mentioned as contributing records. Nevertheless, it is clear that a great deal of additional support will be necessary before the Society is in a position to produce an adequate account of the flora within our area. While at present many interesting (and often surprising) discoveries are being made each year and there can be no doubt that our knowledge of the flowering plants is rapidly increasing, very little is being done in the way of recording the distribution of the less exciting groups. None of the critical genera are being tackled on an area basis and in addition species which are not rare are seldom recorded. While we are grateful for the help already given, we would welcome the assistance of a wider circle of members with a view to the production of an improved edition of *Botanical Records of the London Area.*

Botanical Records for Metropolitan Kent, 1942-1949.

By Francis Rose, B.Sc., F.L.S.

SINCE 1942 work has been in progress, under the writer's editorship, on a new county flora of Kent, as a result of which many interesting records have been made for the parts of Kent within the London Natural History Society's area. The object of this paper is to bring together some of the more important of these records, though some have already appeared in various numbers of the *London Naturalist* between 1944 and 1948 in Mr J. E. Lousley's Botanical Notes.

Metropolitan Kent is possibly the richest botanically of those counties or parts of counties which lie within the Society's area. Like Surrey, it includes much rich chalk grassland and woodland on the North Downs, with an even richer Orchid flora (21 species still occur for certain in the area). Like Essex, it possesses extensive salt and brackish marshes by the Thames side. In addition, there are the fine woods on the Eocene sands and gravels; the rich bog and heath at Keston; the freshwater River Darent with adjacent meadows; and the Gault clay woods near Westerham.

Acknowledgments are due to many persons for help with field-work or identifications; but especially the following:—Messrs R. A. Boniface, Rev. P. H. Cooke, J. E. Lousley, J. B. Marshall, H. M. Pratt (who has sent a very full list from the Dartford area), D. McClintock, and Mrs B. Welch. Personal records of the writer lack initials.

The nomenclature used for British plants is that of the British Ecological Society's "Check List of British Vascular Plants" (*J. Ecol.*, Vol. 33, pp. 308-347, 1946), and for alien species not included in that list G. C. Druce's "British Plant List," Ed. 2, 1928. Alien plants are denoted by †, and new county records for v.-c. 16 since 1942 by *.

Clematis Vitalba L. Plentiful on the ragstone near Riverhead.

Thalictrum flavum L. Barnes Cray, Crayford, 1944. Darenth, *H. M. Pratt.*

Ranunculus pseudo-fluitans auct. angl. Abundant in the Darent from above Eynsford to Darenth. Specimens from here have been determined by Dr R. W. Butcher.

R. trichophyllus Chaix. Pond in Westerham Wood, 1947; *D. McClintock* and *F. Rose.*

R. heterophyllus Weber. Westerham Wood, 1947; *D McClintock* and *F. Rose.*

R. hederaceus L. Keston Ponds, 1948.

R. sardous Crantz. Stone Marshes, 1945.

R. auricomus L. Mounts Wood; *H. M. Pratt.*

Helleborus viridis L.

Var. *occidentalis* Rouy et Fouc. non Reut. Wood west of Shoreham, 1947; *Miss Burnaby-Atkins.* Westerham Wood; *J. Fawkes.*

Aquilegia vulgaris L. Jewells Wood; *A. G. Davis.* Farningham Wood.

†*Berberis vulgaris* L. Holwood; *D. McClintock.*

†*Papaver somniferum* L. South of Greenhithe in cornfields. Stone; *H. M. Pratt.* Hayes, garden escape; *D. McClintock.*

Glaucium flavum Cr. Thames shore at Swanscombe Marshes, 1945; *J. E. Lousley.*

Corydalis claviculata (L.) DC. Hayes Common; *D. McClintock.*

†*C. lutea* (L.) DC. Farningham; *H. M. Pratt.*

Fumaria micrantha Lag. Greenhithe, 1945.

Cheiranthus Cheiri L. Railway cuttings from Dartford to Northfleet, 1943.

Rorippa sylvestris (L.) Besser. Hayes Common; *D. McClintock.*

R. islandica (Oeder) Borbas. Chislehurst Common, 1944.

†*Barbarea intermedia* Boreau. Woolwich Arsenal, 1943.

Cardamine amara L. By Darenth Church, 1944.

Erophila verna (L.) Chevall. As an aggregate species at Keston, Hayes, Dartford Heath, etc.

†*Lobularia maritima* (L.) Desv. Green Street Green, Farnborough; *D. McClintock.*

Cochlearia anglica L. Plumstead Marshes, 1943. Erith; *R. A. Boniface.* Stone, 1945.

†*Sisymbrium altissimum* L. Woolwich Arsenal. St Mary Cray. Hayes; *D. McClintock.*

†*S. orientale* L. Woolwich Arsenal, 1943.

†*Descurainia sophia* (L.) Prantl. By Cotton Farm, Stone; *H. M. Pratt.*

†*Brassica oleracea* L. An escape in railway cutting on chalk, east of Dartford, 1943.

Diplotaxis tenuifolia (L.) DC. Most abundant on waste ground, railway sidings and chalk cuttings from New Cross to Northfleet.

D. muralis (L.) DC. Hayes; *D. McClintock.* Stone; *H. M. Pratt.*

Lepidium campestre (L.) R. Br. Hayes; *D. McClintock.* Cudham; Darenth Wood; Mounts Wood.

L. Smithii Hook. Hayes; West Wickham; *D. McClintock.*

Helianthemum nummularium (L.) Mill. Holwood Park, 1948.

Viola hirta L. Sandy bank on south side of Farningham Wood, 1949.

V. odorata L. South of Farningham, 1949.

Var. *dumetorum* (Jord.) Rouy et Fouc. Stone Castle, 1946. Farningham, 1949.

Var. *imberbis* (Leight.) Hensl. South of Farningham, 1949.

V. calcarea (Bab.) Greg. Biggin Hill, 1948; *Mrs B. Welch.* Hogstrough Hill, 1946.

V. canina L. Dartford Heath, 1946. Hayes; *D. McClintock.*

V. Lloydii Bor. Sundridge; *J. E. Lousley.*

Polygala serpyllifolia Hose. Hayes, Keston, Dartford and Chislehurst Commons.

P. calcarea F. Schulz. Abundant from Biggin Hill eastwards to Shoreham and Otford Downs, but not on the chalk to the north.

Dianthus Armeria L. Railway cutting, Orpington; *D. Stoyel.* Edge of Farningham Wood; *R. A. Boniface.*

†*Saponaria officinalis* L. New Cross; *D. McClintock.*

fl. pleno. Hayes; *D. McClintock.*

Silene nutans L. Abbey Wood, 1948; *R. A. Boniface.*

S. italica (L.) Pers. Greenhithe, many observers to 1949.

Agrostemma Githago L. Green Street Green, 1946.

Sagina ciliata Fries. Hayes Common. Keston Common. Farningham Wood Border; Lane End, near Darenth.

Spergularia marginata (DC.) Kittel. Crayford Ness, 1949.

Stellaria neglecta Weihe. Wet copse by Darenth Church, 1944.

Cerastium arvense L. Horns Cross, Stone; *H. M. Pratt.* South of Greenhithe, 1946.

Moenchia erecta (L.) Gaertn., Mey. et Schreb. Hayes; *D. McClintock.* Keston. Dartford Heath, 1946.

†*Claytonia perfoliata* Donn. Hayes Common; *D. McClintock.* Montreal Park, Riverhead; *H. S. Fawkes.* Bessel's Green, 1949.

†*Hypericum calycinum* L. Abundant by Mount's Road, Greenhithe.

H. Androsaemum L. Weed in Hayes Old Rectory; *D. McClintock.* Swanscombe Wood, 1946.

H. montanum L. Elmstead Lane, Bickley, 1944; The Thrift, near Greenhithe, 1945; Darenth Wood, 1946.

H. quadrangulum L. Holwood Park. Darenth. Riverhead. Brasted.

Geranium versicolor L. Halsted, *Miss Burnaby-Atkins. Ibid.*, 1947; *D. McClintock* and *F. Rose.*

G. pratense L. Chislehurst, in meadow by railway, 1944. Stone; *H. M. Pratt*

†*G. phaeum* L. North of Brasted; *Miss Burnaby-Atkins. Ibid.*, 1947.

G. pyrenaicum Burm. f. Hayes Station; *J. E. Lousley.*

G. rotundifolium L. Gravel pit at Stone, 1946.

†*Oxalis stricta* L. Hayes; *D. McClintock.*

†*Impatiens glandulifera* Royle. Abundant on the Ravensbourne from Bellingham to Lewisham, 1949. Sydenham; West Wickham; *D. McClintock.*

Rhamnus cathartica L. Downe; Cudham.

†*Lupinus arboreus* Sims. Abundant at the Thrift, near Darenth, 1946.

Genista tinctoria L. Rochester Way, Bexley; *H. M. Pratt.*

G. anglica L. Dartford Heath, very fine, 1947.

Trigonella ornithopodioides (L.) DC. Keston Common, 1945, Green Street Green, 1945.

†*Medicago falcata* L.

Var. *tenuifoliolata* Vuyck. Dartford Heath; *H. M. Pratt.*

Melilotus altissima Thuill. Orpington, railway bank, 1946.

†*M. officinalis* (L.) Lam. Now abundant on waste ground from Woolwich and New Cross to Northfleet.

Lotus tenuis Willd. Stone Marshes; Swanscombe Wood, very abundant; Mounts Wood, 1945.

Astragalus glycyphyllos L. Mounts Road, Greenhithe; *J. Priest. Ibid.*, June 1945.

Trifolium subterraneum L. Dartford Heath; Green Street Green. Stone; *H. M. Pratt.*

T. fragiferum L. Stone Marshes, 1945; *J. E. Lousley* and *F. Rose.*

T. glomeratum L. Keston Common; *C. Tristram. Ibid.*, 1946; *F. Rose*; Green Street Green, 1944.

T. suffocatum L. Green Street Green, abundant, 1945.

T. squamosum L. Stone Marshes, 1945; *J. E. Lousley* and *F. Rose.*

†*T. elegans* Savi. Green Street Green, Orpington, 1947; *J. E. Lousley.*

T. medium L. Swanscombe Wood, 1946.

T. striatum L.

Var. *erectum* Gaspar. Hayes Common, 1945; *J. E. Lousley* and *F. Rose.*

†*Vicia cassubica* L. Gravel pit, Stone, 1946. First discovered by Francis Druce in 1931 (*Journ. Bot.*, 1932, 52).

Lathyrus sylvestris L. Still abundant in Swanscombe Wood, the locality from which Gerard noted it in 1597; near Southfleet, 1945.

†*Potentilla recta* L. Swanscombe Wood, 1946.

P. argentea L. Keston Common, 1946.

Sorbus torminalis (L.) Crantz. Darenth Wood, one tree, 1947; Bourne Wood, St Mary Cray, several trees, 1948.

Saxifraga granulata L. Shoreham, 1947. Darenth, 1947; *F. J. Epps.*

Chrysosplenium oppositifolium L. Marshy copse at Twitton, Otford, 1947.

Drosera rotundifolia L. Still manages to survive well at Keston, 1949.

Callitriche truncata Guss.

Var. *occidentalis* (Rouy) Druce. Still plentiful in the Darent at Chipstead.

Epilobium lanceolatum Seb. et Maur. Swanscombe and Mounts Woods; The Thrift, near Greenhithe, 1946.

†*E. adenocaulon* Hausskn. Swanscombe Wood, 1949, det. G. M. Ash.

E. Lamyi F. Schulz. Swanscombe Wood, 1949, det. G. M. Ash.

Bupleurum tenuissimum L. Sea wall, Swanscombe Marshes, 1946.

Oenanthe fistulosa L. Sundridge; *Rev. P. H. Cooke.*

O. Lachenalii C. Gmel. Erith Marshes, 1948; *R. A. Boniface.*

O. pimpinelloides L. One clump in a meadow at Darenth, 1944 et seq.

Galium erectum Huds. Very fine at Downe.

G uliginosum L. Brasted, in meadows by R. Darent, 1945.

Asperula cynanchica L. Downe; Shoreham; E. & W. of Eynsford; Polhill. Biggin Hill.

Valeriana dioica L. Stone, near the railway; *H. M. Pratt.*

V. officinalis L. Hedgebank on chalk, N. of Cudham, 1947.

Aster Tripolium L. Stone Marshes; Erith Marshes; *R. A. Boniface.*

Erigeron acer × *canadensis.* W. border of Farningham Wood, 1945.

**Filago apiculata* G. E. Sm. W. border of Farningham Wood, 1945.

F. minima (Sm.) Pers. W. border of Farningham Wood, 1945. Dartford Heath; *H. M. Pratt.*

Gnaphalium sylvaticum L. Joydens Wood; Farningham Wood; Hollows Wood

†*Galinsoga parviflora* Cav. Abundant in fields west of Swanley, 1948.

Artemisia maritima L. Crayford Ness, 1949; Stone and Swanscombe, 1945.

†*Carduus pycnocephalus* L. Near Swanley, on shoddy, 1948.

C. tenuiflorus Curt Stone Marshes; Mounts Wood; *H. M. Pratt.*

†*Centaurea solstitialis* L. Near Hartley, 1949; *J. E. Lousley, R. Graham,* and *D. McClintock.*

Crepis biennis L. Cudham. West of Otford.

†*Tragopogon porrifolius* L. On river walls below Erith, and at Stone.

Jasione montana L. Sandy cutting by Bromley South Station.

Specularia hybrida (L.) A. DC. Near Greenhithe, 1946.

Vaccinium Myrtillus L. Still at Keston, Hayes and Holwood. Near Well Hill, Chelsfield; *J. B. Marshall.*

Erica Tetralix L. Keston; Chislehurst; Holwood Park; St Paul's Cray Common; Joydens Wood; Petts Wood; 1948-9.

Monotropa Hypopithys L. Wood west of Shoreham.

Samolus Valerandi L. Swanscombe Marshes. Erith, 1948; *R. A. Boniface.* Plumstead Marshes, 1949.

**Gentiana anglica* Pugsl. Kemsing Downs, 1946.

Lithospermum officinale L. Swanscombe Wood; Downe. Eynsford; Shoreham.

Echium vulgare L. Swanscombe chalkpits; E. of Eynsford; Polhill.

†*Calystegia sylvestris* (Willd.) Roem. et Schult. Near Northfleet Station, 1946.

Cuscuta epithymum (L.) Murray. On furze and heather, Keston Common.

Atropa bella-donna L. Erith; The Thrift; S.E. of Dartford.

Verbascum Lychnitis L. St Mary Cray Station; Green Street Green, Orpington; Morant's Court Hill. N. of Darenth Wood; *H. M. Pratt.*

Pedicularis sylvatica L. Hayes Common. Dartford Heath; *H. M. Pratt.*

Melampyrum pratense L.

Var. *ericetorum* D. Oliver. Keston Common; *C. E. Britton.*

Calamintha nepeta (L.) Savi. Abbey Wood, 1948; *R. A. Boniface.* Stone. Green Street Green, near Darenth, 1946.

Salvia pratensis L. Farnborough, now destroyed.

†*S. verticillata* L. Dartford Creek; *H. M. Pratt.*

Nepeta Cataria L. Swanscombe Marshes. Mounts Wood; *H. M. Pratt.*

Glecoma hederacea L. A very large flowered form occurs in Mounts and Darenth Woods. I have been unable to trace a reference in literature to this plant which often bears pink flowers.

Scutellaria minor Huds. Keston Bog; Holwood, 1944.

Galeopsis speciosa Mill. Gravel pits, Dartford; *H. M. Pratt.*

Ajuga Chamaepitys (L.) Schreb. In natural chalk turf where rabbits burrow, S.E. of Eynsford, 1949; Cornfield at Greenhithe, 1946.

Chenopodium murale L. Near Farningham Wood. Abbey Wood; *R. A. Boniface.*

Salicornia europaea L. Swanscombe Marshes, 1945; *A. J. Wilmott* and *F. Rose.*

S. Smithiana Moss. Swanscombe Marshes, 1945; *A. J. Wilmott* and *F. Rose.* Crayford Ness, 1949.

Suaeda maritima (L.) Dum. Swanscombe. Stone. Crayford Ness.

Polygonum Bistorta L. North Cray; *J. B. Marshall.* Now abundant at Brasted and Sundridge.

Rumex palustris Sm. Swanscombe Marshes, 1946; *L.N.H.S. Excursion.* Abbey Wood Pond; *R. A. Boniface.* Woolwich Arsenal, 1944.

R. pulcher L. Green Street Green, near Darenth.

Daphne Laureola L. Farningham, Joydens, Darenth and Swanscombe Woods.
†*Cannabis sativa* L. Green Street Green, near Orpington; *D. McClintock*.
Neottia Nidus-avis (L.) L. C. Rich. E. of Downe; W. of Shoreham.
Cephalanthera Damasonium (Mill.) Druce. In a beechwood one mile from the centre of Dartford, 1944.
Epipactis Helleborine (L.) Crantz. emend. Rend. et Britt. Very fine in a chalk-pit at Swanscombe.
E. purpurata Sm. Swanscombe Wood; *C. L. Collenette*.
E. palustris (L.) Crantz. Abundant but dwarf in a chalkpit at Swanscombe.
Anacamptis pyramidalis (L.) L. C. Rich. Stone; Swanscombe; Dartford.
Orchis purpurea Huds. In the parishes of Chelsfield, Otford and Kingsdown
O. Morio L. Shoreham Meadows; *F. J. Epps*. Romney Street.
O. mascula L. Darenth Wood, 1949. Common on the Downs in woods.
O. latifolia L. sec. Pugsl. Riverhead, 1949; *H. S. Fawkes*.
O. praetermissa Druce. Swanscombe chalkpits.
O. ericetorum (E. F. Linton) E. S. Marshall. Keston Bog, 1946.
O. Fuchsii Druce. Common on the chalk. Darenth Meadows.
O. Fuchsii × *praetermissa*. A fine series of hybrids in Swanscombe chalkpits.
Aceras anthropophorum (L.) S. F. Gray. Mounts Wood, Greenhithe; Polhill chalkpit; abundant E. of Shoreham, Eynsford and Otford, 1949.
Ophrys apifera Huds. Swanscombe chalkpit; abundant at Romney Street, 1949
O. insectifera L. Downe; Cudham; W. of Shoreham; Eynsford.
Herminium Monorchis (L.) R. Br. Downe, very fine; Polhill.
Gymnadenia Conopsea (L.) R. Br. Downe; Polhill; Eynsford to Otford, 1949.
Platanthera bifolia (L.) Rich. emend. Rchb. Darenth Wood, 1947; Hog Wood and Highcastle Wood, both near Kingsdown, 1949.
P. chlorantha (Custer) Rchb. S. of Cudham; Westerham Wood, 1949.
Iris foetidissima L. Swanscombe and Darenth Woods.
Narcissus Pseudo-Narcissus L. Still very plentiful (protected) in Abbey Wood.
Ruscus aculeatus L. Farningham, Darenth and Swanscombe Woods.
Polygonatum multiflorum (L.) All. Joydens, Farningham and Darenth Woods.
Convallaria majalis L. In most of the woods on Blackheath Beds, and in Keston Bog.
Paris quadrifolia L. Westerham Wood; *H. S. Fawkes*.
Juncus Gerardi Lois. Frequent in the marshes from Plumstead to Northfleet.
J. maritimus Lam. Swanscombe Marshes.
J. subnodulosus Schrank. Ditch at Barnes Cray, Crayford, 1944.
Luzula sylvatica (Huds.) Gaud. Joydens, Darenth and Swanscombe Woods.
L. Forsteri (Sm.) DC. Darenth, Joydens, Farningham Woods, etc.
Baldellia ranunculoides (L.) Parl. Still in pond on Chislehurst Common, 1946.
Triglochin maritima L. Erith to Northfleet.
Ruppia maritima L. Stone and Erith Marshes.
**Heleocharis uniglumis* (Link.) Schultes. Northfleet Brooks, 1946.
Scirpus caespitosus L. Seven clumps on Keston Common, 1947.
S. setaceus L. Keston Common; *J. B. Marshall*.
Eriophorum angustifolium Honck Wet disused railway cutting, Swanscombe Wood.
Carex divisa Huds. Plumstead, Erith, Stone and Swanscombe Marshes; Northfleet Brooks.
C. disticha Huds. Northfleet Brooks
C. paniculata L. Northfleet Brooks.
C. Pairaei F. Schultz. Bickley; Lane End near Darenth; Bessel's Green.
C. echinata Murr. Keston Bog.
**C. lepidocarpa* Tausch. Holwood Park, 1948; *L.N.H.S. Excursion*.
C. tumidocarpa Anderss. Keston Bog.
Calamagrostis epigeios (L.) Roth. Hayes Common; *D. McClintock*.
Apera Spica-venti (L.) Beauv. Green Street Green; *J. P. M. Brenan*.
Puccinellia maritima (Huds.) Parl. Erith Marshes to Northfleet.
P. distans (L.) Parl. Swanscombe and Erith Marshes.
P. pseudo-distans (Crép.) Jans. et Wacht. Stone Marshes; *J. E. Lousley, det. P. Jansen*.

P. fasciculata (Torr.) Bick. Stone Marshes, 1945; *J. E. Lousley* and *F. Rose.* Swanscombe Marshes.

P. rupestris (With.) Fern. et Weath. Swanscombe Marshes.

×*Festulolium loliaceum* (Huds.) P. Fourn. Darenth Meadows.

Agropyron caninum (L.) Beauv. Darenth Meadows, 1944, *det. A. J. Wilmott.*

A. pungens (Pers.) Roem. et Schult. Erith; Crayford; Stone; Swanscombe.

Parapholis strigosus (Dumort.) C. E. Hubbard. (*Lepturus filiformis* (Roth) Trimen). Stone and Swanscombe Marshes.

Nardus stricta L. Keston and Chislehurst Commons; Dartford Heath.

Juniperus communis L. Downe, rare; locally abundant east of Shoreham Station.

Blechnum Spicant (L.) Roth. Farningham and Joydens Woods; Holwood Park; south of Chelsfield, 1945.

Athyrium Filix-foemina (L.) Roth. Joydens Wood; Holwood Park, abundant; North Cray Brooks, on peat, 1945.

Ceterach officinarum DC. Hayes Church; *D. McClintock.*

Thelypteris Oreopteris (Ehrh.) C. Chr. Joydens Wood, 1945.

Polypodium vulgare L. In park beside Keston Common.

Ophioglossum vulgatum L. Very large (6 to 8 ins. high) in chalkpit at Swanscombe.

Abstracts from Literature Relating to Botany.

By Douglas N. Kent.

In presenting the following selection of abstracts from literature it is hoped not only to provide a digest of the various papers which refer exclusively to the London Area but also to give references to those dealing with Taxonomy and Nomenclature.

TAXONOMY.

Nasturtium. Howard, H. W., and A. G. Lyon; *Watsonia,* I, part IV, 228-233 (January 1950), discuss *N. officinale* R. Br., *N. microphyllum* Boenn. ex Reichb. and the hybrid between them and give further characters by which the plants may be distinguished. The known British distribution is also outlined, from which it would appear that the authors have seen material from the following vice-counties in the London Area:—*N. officinale,* v.-c.'s 17-21 and 24; *N. officinale* × *microphyllum,* v.-c.'s 17, 21 and 24; *N. microphyllum,* v.-c.'s 16-17, 19-21 and 24.

Rubus. Watson, W. C. R.; *Watsonia,* I, part II, 71-83 (April 1949), discusses the various species of brambles described by Weihe, and gives the distribution of those found in Britain. *Rubus vulgaris* Weihe et Nees var. *mollis* Weihe et Nees is redescribed as a distinct species:—*R. latiarcuatus* nom. nov., and is recorded from Putney Heath (v.-c. 17). Records of numerous other brambles found in the London area are also given.

Alchemilla. Walters, S. M.; *Watsonia,* I, part I, 7-18 (January 1949), describes the micro-species of *Alchemilla vulgaris* L. and discusses their distribution in Britain. Species which may be found in the London area are *A. vestita* (Bus.) Raunk. and *A. xanthochlora* Rothm.

Aphanes. Walters, S. M.; *Watsonia*, I, part III, 163-169 (October 1949), gives an account of the differences between *Aphanes arvensis* L. and *A. microcarpa* (Boiss. et Reut.) Rothm. and describes the known vice-comital distribution. The " fruits " of *A. microcarpa* are 1.4-1.8 mm. and those of *A. arvensis* 2.2-2.6 mm. in length. The calyx-teeth of *A. microcarpa* are very much smaller and usually converge, whereas in *A. arvensis* they are more conspicuous and spreading from a distinct neck at the top of the urceole. Both plants are recorded from the London area, but *A. microcarpa* is more or less restricted to acid soils, while *A. arvensis* appears to be indifferent to soil acidity.

Artemisia. Brenan, J. P. M.; *Watsonia*, I, part IV, 209-223 (January 1950), gives a detailed account of *Artemisia Verlotorum* Lamotte and its spread from Western China through Europe to Britain. A complete description of the plant is given and a full history of its known distribution in Britain is also outlined. It would appear that the species is locally abundant in various areas near the Thames in Middlesex (v.-c. 21) and Surrey (v.-c. 17), and is also recorded more sparingly from other widely-separated areas in those two counties. There is one record from Herts. (v.-c. 20), but the plant has not so far been reported from any other of the London area vice-counties; it will however possibly be found to occur in Bucks. (v.-c. 24).

Ulmus. Melville, R.; *Journ. Linn. Soc. (Botany)*, LIII, No. 352, 263-271 (10 March 1949), describes *Ulmus Coritana*, a new species of British elm, with a distribution extending through East Anglia and across the Midlands, southward to the Thames Valley and northwards to the Trent Valley. Three vars. are also described:—*media* (type), *rotundifolia* and *angustifolia*. The tree may possibly be found in the Society's area, as the author records it from just beyond our boundary at Billericay (v.-c. 18) and Eastwick (v.-c. 20).

Salix. Rechinger, K. H.; *Watsonia*, I, part III, 154-162 (October 1949), gives a key to the British species of *Salix*.

TOPOGRAPHICAL.

V.-c. 16. West Kent. Rose, F.; *Trans. Brit. Bryol. Soc.*, I, part 3, 202-210 (August 1949), commences an ecological account of the Bryophyte flora of Kent.

V.-c. 17. Surrey. Airy-Shaw, H. K. (Editor); *Kew Bull.*, No. 2, 231-238 (July 1949), gives further additions to the wild flora of the Royal Botanic Gardens, Kew. The records include a south European alien new to Britain, viz., *Corrigiola telephiifolia* Pourr., discovered by Miss S. Ross-Craig in October 1947. Two Hepatics and sixteen species of Fungi new to the area are also recorded.

V.-c. 18. South Essex. Ross, Joseph; *Essex Nat.*, 28, part 3, 134-136 (March 1949), records 62 species of Mycetozoa found in Epping Forest during 1947-48.

V.-c. 20. Herts. Gregory, P. H.; *Trans. Herts. Nat. Hist. Soc.*, XXIII, part 2, 54-55 (February 1949), gives details of the more interesting species of Fungi found in Hertfordshire between 1945 and 1947.

Among the records is one by Miss M. M. O. Douglas reporting in 1945 the occurrence at Bushey Heath of the rare *Clathrus cancellatus.* There are a number of records from Bricket Wood, including a species new to Britain, viz., *Microsphaera alphitoides*, discovered in 1945 by Messrs N. Robertson and I. Macfarlane. On the same foray Dr Alex. Smith found in Bricket Wood another rare fungus, *Peronospora dipsaci*, which had previously only been reported once in this country, namely from Somerset.

V.-c. 21. Middlesex. Kent, D. H.; *Watsonia*, I, part II, 92-101 (April 1949), records additions and corrections to Druce's *Comital Flora.*

NOMENCLATURE.

Melandrium. Sandwith, N. Y.; *The Nat.*, 829, April-June, 47 (June 1949), records that the correct name for the glabrous White Campion is *Melandrium album* (Mill.) Garcke var. *viscosum* (F. Aresch.) Ahlfvengren in Neuman and Ahlfvengren *Sveriges Flora*, p. 524 (1901). The colony of plants at Chiswick (v.-c. 21) (see *The Nat.*, 825, April-June, 45-46 (June 1948) has been destroyed by bulldozing operations but the solitary plant at Ham Pits (v.-c. 17) still survives.

Galinsoga. Lousley, J. E.; *Watsonia*, I, part IV, 238-241 (January 1950), discusses at length the nomenclature of the two species of *Galinsoga* which occur as adventives in Britain and shows that *G. quadriradiata* Ruiz. et Pav. is an invalid name, the correct name for the species being *G. ciliata* (Raf.) Blake.

Mentha. Graham, R. A.; *Watsonia*, I, part II, 88-90 (April 1949), shows that *Mentha rubra* Huds. is an illegitimate name under the International Rules and proposes in its place *M. Smithiana* nom. nov.

PLANT STUDY, COLLECTING AND HERBARIUM TECHNIQUE.

Phanerogams. Bangerter, E. B.; *Countryside*, XV, No. 3, 70-74 (July 1949), gives a guide to collecting, preserving and mounting specimens, and the construction of a herbarium.

Cryptogams. Castell, C. P.; *Countryside*, XV, No. 1, 7-14 (February 1949), describes how to begin the study of Mosses and Liverworts.

PALAEOBOTANY.

Reid, Mrs E. M., F.L.S., F.G.S.; *New Phytol.*, 48, No. 2, 245-252 (June 1949), provides an interesting account of the late-glacial flora of the Lea Valley. Records are given of fossilized plant remains discovered in pits at Broxbourne (v.-c. 20) and Waltham Cross, Ponders End and Tottenham (v.-c. 21).

MISCELLANEOUS.

Raphanus. Sandwith, N. Y.; *Watsonia*, I, part II, 117-118 (April 1949), describes *Raphanus raphanistrum* L. var. *violaceus* Woerlein, a variety new to Britain found on a blitzed site at Ravenscourt Park, Hammersmith (v.-c. 21).

STELLARIA. Haskell, Gordon; *Journ. of Genetics*, 49, No. 3, 291-301 (December 1949), discusses variation in the number of stamens in *Stellaria media* (L.) Vill., and describes experiments carried out with seeds obtained from material collected at Ealing Common (v.-c. 21), John Innes Grounds, Merton (v.-c. 17), Bournemouth (v.-c. 11) and Talbot Heath, Dorset (v.-c. 9). The results showed that the most frequent number of stamens borne by individual flowers was 3, followed in consecutive order by 5, 4 and 2. Only one plant had 7, and none had 8, 9 or 10.

LYCOPERSICON. *Evening News*, August 31, 1949, records the occurrence of thousands of tomato (*Lycopersicon esculentum* Hill) plants beside the Piccadilly railway line at Arnos Grove (v.-c. 21). The plants apparently appeared spontaneously from specimens previously cultivated on nearby railway bank allotments.

SCILLA. Pearce, T. R., and J. S. L. Gilmour; *New Phytol.*, 48, No. 1, 115-117 (February 1949), describe the results of experiments carried out on the effect of picking on the flowering bluebell (*Scilla non-scripta* (L.) Hoffm. et Link.). The experiments were carried out in Bagley Wood near Oxford between 1934 and 1939, and at the Royal Botanic Gardens, Kew, between 1933 and 1940. From the results obtained it would appear that little harm is done by moderate picking over large areas.

Hepatics of the London Area.

By R. A. BONIFACE.

NO serious attempt seems to have been made to work out the distribution of the Hepaticae, or Liverworts, in the London Area, except in a few special cases, such as the Bookham Common and other ecological surveys, and a few districts which have had their Flora listed by local botanists. The Society's Area on the whole is not rich in species, as might be expected from the present-day dryness of much of ground. This is thought to be due to a general lowering of the water-table, resulting in the gradual drying-up of most of the sphagnum bogs and marshes, causing the disappearance of many bog species which grew in them. Atmospheric pollution is also an important factor near London. This is shown by St. John Marriott's ecological account of Abbey Woods (1925), which contains a very full list of bryophytes, few of which can be found at the present day, although the woods appear to be unaltered in other respects. The South and South-western suburbs are less affected, as Wimbledon Common continues to be an excellent hunting ground, and most of the species recorded in the past can still be found.

The Blackheath Beds and sandy deposits South-East of London are the richest in species, next come the gravelly and sandy commons of Surrey and the North slope of Boxhill, just in the twenty-mile limit, and the finest locality near London for chalk bryophytes. The London

Clay areas North of the Thames are rather poor except where capped with sand or gravel, as at Hampstead Heath, Stanmore and Ruislip.

The large section of Hertfordshire in the Society's Area seems to be completely neglected by present-day botanists, and there are few recent records for flowering plants or bryophytes from here. Other areas wanting in records are v.-c. 18, South Essex (except Epping Forest, which is fairly well known); v.-c. 19, North Essex; v.-c. 21, Middlesex (the North-East corner requires exploring), and v.-c. 24, Bucks.

With a few exceptions, the following list has been compiled from records and observations made during the last four years, and thanks are due to the following members for contributing valuable notes:—Messrs F. Rose, E. C. Wallace, J. H. G. Peterken, C. P. Castell, A. H. Norkett and K. C. Harris. Where a record is not followed by the finder's initials, the author alone is responsible. The nomenclature used is that given in *A Census Catalogue of British Hepatics*, by A. Wilson (1930).

Riccia glauca L. Bare sandy soil, rare. V.-c. 16. Keston, *F.R.* V.-c. 17. Norbury Park, *C.P.C.*

Riccia sorocarpa Bisch. Damp soil, occasionally abundant in fallow fields. This and the last species are probably commoner than the few records suggest. V.-c. 16. Sandy field near Orpington. Keston Common, *F.R.* Farningham Wood. Joyden's Wood, *F.R.* V.-c. 17. Sandy path, top of Boxhill.

Riccia fluitans L. Floating in ponds and ditches, common. V.-c. 17. Pond on Burgh Heath, *E.C.W.* Weybridge, *C.P.C.* V.-c. 18. Cuckoo pits, Epping Forest, *J.H.G.P.* V.-c. 20. Pond near Bayford, *J.H.G.P.* V.-c. 21. Viaduct pond, Hampstead Heath, abundant, *H. C. Harris.* Ruislip reservoir, abundant, *F. E. Wrighton.* Pond near Stanmore Heath. Pond in Home Park, Hampton Court.

Ricciocarpus natans (L.) Corda. Floating in ponds, very rare. V.-c. 18. Two ponds in Epping Forest, plentiful, *J.H.G.P.* V.-c. 21. Old canal at West Drayton, *H. Banks.*

Conocephalum conicum (L.) Dum. Damp shady banks, rare near London. V.-c. 16. Chiselhurst, *F.R.* V.-c. 17. Roadside ditch near Chessington, abundant. Mickleham. V.-c. 21. Pond embankment, Town Park, Enfield, *J. Proskaver.* V.-c. 24. Oak End, Denham, fruiting well, *K.C.H.*

Lunularia cruciata (L.) Dum. Common and generally distributed on damp garden walls, greenhouses, and wet banks.

Marchantia polymorpha L. A sporadic species, occurring plentifully on cinder paths, waste ground and wet banks. V.-c. 16. Damp bank, Farningham Wood. V.-c. 17. Banks of the Thames in several places. Woodcote Park, *E.C.W.* Wimbledon Common, *C.P.C.* Chessington, *A.H.N.* Bookham Common, *C.P.C.* V.-c. 18. Leyton. Epping Forest, *J.H.G.P.* V.-c. 21. Bomb sites, Cripplegate, abundant, *F. E. Wrighton.* Garden at Hampstead. Gray's Inn Road, *E.C.W.* Shepherd's Bush, *J.H.G.P.* Osterley Park, *C.P.C.* Hampton Court, *F.R.* V.-c. 24. Canal side from Uxbridge to Denham, *K.C.H.*

Aneura pinguis (L.) Dum. Wet banks and boggy ground, rather rare. V.-c. 16. Farm Wood, *F.R.* Swanscombe Wood, *F.R.* Damp sandy bank near Farningham Wood. V.-c. 17. Esher Common, *J.H.G.P.* Chessington, *A.H.N.* V.-c. 18. Chig Bridge, Chigwell Row, *J. Proskaver.*

Aneura multifida (L.) Dum. Boggy ground, not common. V.-c. 16. Holwood Park, *F.R.* Wet places in Joyden's Wood, Bexley. V.-c. 17. Bookham Common, *A.H.N.* Limpsfield Common, *C.P.C.* V.-c. 18. Epping Forest, *C.P.C.*

Aneura sinuata (Dicks.) Dum. Var. *major* Lindb. Moist heathy ground, rare. V.-c. 16. Swanscombe Wood, *F.R.* V.-c. 24. Denham Golf Course, abundantly fertile, *K.C.H.*

Metzgeria furcata (L.) Dum. On trees; not common near London. V.-c. 16. Downe. Hollow's Wood, near Shoreham, *F.R.* Joyden's Wood, Bexley. V.-c. 17. Boxhill. Bookham Common, *A.H.N.* Fetcham Downs, *C.P.C.* Norbury Park, *C.P.C. & E.C.W.* V.-c. 18. Epping Forest, very rare, *J.H.G.P.* V.-c. 21. Springwell lane, Harefield.

Pallavicinia Lyellii (Hook.) Gray. Wet sandstone rocks and boggy ground, rare. Known only from a dozen counties in England, a surprising find in a well-worked area. V.-c. 17. Farm bog, Wimbledon Common, sparingly, *R.A.B. & F.R.*

Pellia epiphylla (L.) Corda. Damp banks and wet places, very common; occurs in all districts.

Pellia Fabroniana Raddi. Damp banks and by springs, not common. V.-c. 16. Shoreham, *F.R.* Downe. Greenhithe, *F.R.* Path-sides in Joyden's Wood, Bexley. V.-c. 17. Norbury Park, *C.P.C.* Chessington, *A.H.N.* Several places on the northern slopes of Boxhill, *E.C.W.* V.-c. 21. Springwell chalk pit, Harefield.

Fossombronia pusilla (L.) Dum. Bare moist ground, not common. V.-c. 17. Bookham Common, *A.H.N.* V.-c. 21. Ruislip Common, *K.C.H.*

Fossombronia Wondraczeki (Corda) Dum. Bare moist ground, rare. V.-c. 16. Sandy paths in Joyden's Wood, Bexley. V.-c. 17. Bookham Common, *A.H.N.*

Blasia pusilla L. Sandy banks, rare. V.-c. 17. Oxshott Heath, *J.H.G.P.*

Alicularia scalaris (Schrad) Corda. Sandy heaths, common. V.-c. 16. Keston Common. Pett's Wood, *F.R.* Holwood Park, *F.R.* Joyden's Wood, Bexley. V.-c. 17. Near Kingswood Church, *E.C.W.* V.-c. 20. Near Oxhey Woods, abundant. V.-c. 21. Abundant on Harrow Weald Common and roadside banks near. Ruislip, *J.H.G.P.* V.-c. 24. Denham Golf Course, *K.C.H.*

Eucalyx hyalinus (Lyell) Breidl. Bare moist soil; a sub-alpine species recorded only from three southern counties. Found during the Bookham Common Survey, 1947. V.-c. 17. Muddy pit on Bookham Common, *A.H.N.*

Aplozia crenulata (Sm.) Dum. Wet ground, path-sides, etc., common. V.-c. 16. Keston. St Paul's Cray Common, *F.R.* Holwood Park, *F.R.* Joyden's Wood, Bexley. V.-c. 17. Wimbledon Common, *C. Avery.* Near Kingswood Church, *E.C.W.* V.-c. 21. Ruislip Woods, *K.C.H.* Harrow Weald Common.

Var. *Gracillima* (Sm.) Heeg. V.-c. 18. Epping Forest, *J.H.G.P.* V.-c. 21. Harrow Weald Common. Ruislip Woods.

Gymnocolea inflata (Huds.) Dum. Damp heaths, common and generally distributed. V.-c. 16. Pett's Wood, *F.R.* Abbey Wood. St Paul's Cray Common, *F.R.* Joyden's Wood. V.-c. 17. Wimbledon and Sheen Commons, plentiful. Esher Common. Near Kingswood Church, *E.C.W.* V.-c. 18. Epping Forest. V.-c. 21. Harrow Weald Common. Ken Wood and Hampstead Heath. V.-c. 24. Black Park, plentiful.

Lophozia turbinata (Raddi) Steph. Damp chalk, not uncommon in calcareous districts. V.-c. 16. Greenhithe, *F.R.* Downe and Shoreham, *F.R.* V.-c. 17. Boxhill. V.-c. 21. Springwell chalk pit, Harefield. Wet chalk at Harefield, *K.C.H.*

Lophozia ventricosa (Dicks.) Dum. Woods and heaths, locally frequent. V.-c. 16. Keston Common. Dartford Heath, *F.R.* Hollow's Wood, Shoreham, *F.R.* Joyden's Wood, Bexley. V.-c. 18. Plentiful in parts of Epping Forest. V.-c. 20. Abundantly at Ninning's Farm near Maple Cross, *K.C.H.*

Lophozia bicrenata (Schmid) Dum. Sandy heaths, rare. V.-c. 16. Keston Common. Farm Wood, *F.R.* Joyden's Wood, *F.R.* V.-c. 17. Wimbledon Common. Sheen Common amongst heather. V.-c. 21. Hounslow Heath.

Lophozia excisa (Dicks.) Dum. Sandy heaths, rare. V.-c. 16. Joyden's Wood, near Bexley, *F.R*

Sphenolobus exsectiformis (Breidl.) Steph. Bare sandy soil, rare. V.-c. 16. Sandy path, Joyden's Wood. V.-c. 17. Oxshott Heath, *E.C.W.*

Plagiochila asplenioides (L.) Dum. Woods, frequent; absent from the clay areas. ? V.-c. 16. Joyden's Wood. Farm Wood, *F.R.* Hollow's Wood and Holwood Park, *F.R.* V.-c. 17. Woodcote Park, Epsom, *E.C.W.* Oxted, *J.H.G.P.* V.-c. 24. Near Ninning's Farm, Maple Cross, *K.C.H.*

Var. *major* Nees. V.-c. Boxhill, *J.H.G.P.*, etc.

Lophocolea bidentata (L.) Dum. Clay banks and wet grassy places, common; found in all districts.

Lophocolea cuspidata Limpr. Similar situations to the above, but less common. V.-c. 16. Joyden's Wood, *F.R.* Downe. Shoreham, *F.R.* V.-c. 17. Fetcham, *A.H.N.* Bookham Common, *C.P.C.* Boxhill, *J.H.G.P.* Limpsfield Common, *C.P.C.* Norbury Park, *C.P.C.* V.-c. 21. Damp wood in Bushy Park. Ruislip area, *K.C.H.*

Lophocolea alata Mitt. ex Larter. Moist banks, rare. V.-c. 17. Boxhill, *E.C.W.* V.-c. 18. Chig Bridge, Chigwell Row, *J. Proskaver.*

Lophocolea heterophylla (Schrad) Dum. On dead wood and wet banks, very common; found in all districts.

Chiloscyphus polyanthus (L.) Corda. By streams and in swamps, not common. V.-c. 16. Pett's Wood, *F.R.* Holwood Park, *C.P.C.* & *F.R.* V.-c. 17. Leatherhead, *J.H.G.P.* Norbury Park, *C.P.C.* Fetcham, *A.H.N.* Bookham Common, *C.P.C.* Farm bog, Wimbledon Common. V.-c. 18. Epping Forest. V.-c. 21. Ruislip woods, *J.H.G.P.* Bushy Park.

Cephalozia bicuspidata (L.) Dum. Heaths and woods; common and generally distributed.

Cephalozia connivens (Dicks.) Lindb. Boggy heaths, sometimes on wet stumps, rare near London. V.-c. 16. Keston Common, *F.R.* Joyden's Wood, Bexley. V.-c. 17. Oxshott heath, *E.C.W.* Esher Common, on stumps. Farm bog, Wimbledon Common, *C. Avery.* V.-c. 24. Black Park.

Cephalozia media Lindb. Bogs and peaty banks, rare. V.-c. 16. Keston Common, *F.R.* Damp shady bank in Joyden's Wood. V.-c. 17. Oxshott Heath, *E.C.W.* Bookham Common, *A.H.N.*

Cephalozia Francisci (Hook.) Dum. Moist peaty banks, very rare. V.-c. 16. Banks by the pond, Holwood Park, *F.R.* & *E.C.W.*

Cephaloziella Starkii (Funck) Schiffn. Woods and heaths, not common. V.-c. 16. Keston Common, *F.R.* St Paul's Cray Common, *F.R.* Near Joyden's Wood. V.-c. 17. Sheen Common. V.-c. 21. Hampstead Heath, *F.R.* Ruislip woods, *K.C.H.*

Cephaloziella Hampeana (Nees) Schiffn. Woods and heaths, rare. V.-c. 17. Damp peat, Esher Common, *E. F. Warburg.*

Cephaloziella myriantha (Lindb.) Schiffn. Sandy heaths, rare. V.-c. 17. Pine stump on Esher Common, *E.C.W.*

Odontoschisma Sphagni (Dicks.) Dum. Sphagnum bogs, rare. V.-c. 16. Keston Common bog, sparingly.

Odontoschisma denudatum (Nees) Dum. Peaty heaths, rare. V.-c. 17. Known for many years on Oxshott Heath, still plentiful, 1949, *E.C.W.*

Calypogeia Trichomanes (L.) Corda. Heaths and woods, common. V.-c. 16. Keston. Joyden's Wood. V.-c. 17. Sheen and Wimbledon Commons. Oxshott. Bookham Common. V.-c. 18. Epping Forest. V.-c. 20. Hoddesdon Woods, *J.H.G.P.* V.-c. 21. Harrow Weald Common. V.-c. 24. Denham Golf Course. *K.C.H.*

Calypogeia fissa (L.) Raddi. Wet heaths and woods, common. V.-c. 16. Keston Common. Joyden's Wood. St Paul's Cray Common, etc., *F.R.* V.-c. 17. Wimbledon Common, abundant. Chessington, *A.H.N.* V.-c. 18. Epping Forest. V.-c. 21. Hampstead Heath bog and Ken Wood. Ruislip woods, *K.C.H.* V.-c. 24. Black Park.

Calypogeia arguta Nees et Mont. Loamy banks, rare. V.-c. 17. Stag bog and other places on Wimbledon Common. Bookham Common, *C.P.C.*

Lepidozia reptans (L.) Dum. Heaths and woods, frequent. V.-c. 16. St Paul's Cray Common. Darenth Wood, *F.R.* Holwood Park. Joyden's Wood. Pett's Wood, *F.R.* Abbey Wood. V.-c. 17. Oxshott Heath. Base of a beech trunk, Boxhill, *C.P.C.* V.-c. 18. Epping Forest, abundant. V.-c. 21. Ken Wood, Hampstead, abundant. V.-c. 24. Oak End, Denham, *K.C.H.* Black Park, plentiful.

Lepidozia trichoclados K. Müll. Moist peaty banks, rare. V.-c. 21. Mad Bess Wood, Ruislip, *K.C.H.*

Ptilidium pulcherrimum (Web.) Hampe. On various trees, very rare in the south. V.-c. 16. Joyden's Wood, on an oak tree, *F.R.* V.-c. 18. Epping Forest, on a hornbeam, *J.H.G.P.*

Diplophyllum albicans (L.) Dum. Heaths and woods, common. V.-c. 16. Keston Common. Joyden's Wood. Pett's Wood. St Paul's Cray Common, *F.R.* V.-c. 17. Oxshott. V.-c. 18. Epping Forest. abundant. V.-c. 20. Hoddesdon Woods, *J.H.G.P.* V.-c. 21. Ken Wood, Hampstead, rare. Ruislip area, *K.C.H.* Harrow Weald Common, abundant. V.-c. 24. Black Park.

Scapania compacta (Roth) Dum. Moist sandy ground, rare. V.-c. 24. Denham Golf Course, *K.C.H.*

Scapania aspera Bernet. Calcareous soil, rare. V.-c. 17. Two areas on the north slope of Boxhill.

Scapania nemorosa (L.) Dum. Woods and sandy banks, rare. V.-c. 16. Holwood Park, *F.R.* Joyden's Wood. V.-c. 20. Hoddesdon Woods, *J.H.G.P.* V.-c. 21. Ruislip Woods, *K.C.H.*

Scapania undulata (L.) Dum. On stones in streams, often submerged. V.-c. 21. Park Wood, Ruislip.

Scapania irrigua (Nees) Dum. Sandy heaths and woods, rare. V.-c. 21. Ruislip Woods, *K.C.H.* Park Wood, Ruislip.

Scapania curta (Mart.) Dum. Woods and heaths, rare. V.-c. 21. Ruislip Woods, *K.C.H. & J.H.G.P.*

Radula complanata (L.) Dum. On various trees, rare near London. V.-c. 16. Hollow's Wood, *F.R.* V.-c. 17. Mickleham Downs, *C.P.C.* Fetcham, *A.H.N.* Bookham Common, *C.P.C.*

Madotheca laevigata (Schrad) Dum. Var. *thoja* (Dicks.) Dum. Calcareous soils, rare. V.-c. 17. Several patches on the north slope of Boxhill amongst *Cornus* scrub.

Madotheca platyphylla (L.) Dum. Chalk downs and old walls, common. V.-c. 16. Downe, *F.R.* Shoreham. Eynsford, *F.R.* V.-c. 17. Mickleham, *C.P.C.* Old wall at Limpsfield. Norbury Park, *C.P.C.* Old walls in Headley lane, abundant. Woldingham, *J.H.G.P.* V.-c. 21. Harefield on chalk, *K.C.H.*

Cololejeunea minutissima (Sm.) Schiffn. On trees, very rare. V.-c. 17. On maple in Headley lane, *N. Y. Sandwith.*

Lejeuna cavifolia (Ehrh.) Lindb. On trees, sometimes on soil and rocks, rare. V.-c. 16. Hollow's Wood, Shoreham, *F.R.* V.-c. 17. Above the R. Mole near the stepping stones, Boxhill, *E.C.W.*

Microlejeunea ulicina (Tayl.) Evans. On trees, usually beech, rare near London. V.-c. 17. By the Mole, Boxhill. Beeches, N. slope of Boxhill, *C.P.C.* Mickleham, *E.C.W.*

Frullania Tamarisci (L.) Dum. Rare. V.-c. 17. Very abundant amongst *Cornus* scrub, north slope of Boxhill.

Frullania dilatata (L.) Dum. On various trees, rare near London. V.-c. 16. Downe, *F.R.* V.-c. 17. Fetcham Downs, *C.P.C.* Boxhill. Bookham Common, *C.P.C.* Walton Heath, *E.C.W.* Norbury Park, *C.P.C.* Limpsfield Common, *C.P.C.*

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Maps: Topographical and Geological.

Their Potentialities and Limitations.

By G. W. Himus, Ph.D., M.I.Chem.E., F.G.S.

Read to the Geological Section, 28th June, 1949.

THE geologist, even in these enlightened days of 1949, is probably pictured as a rather desiccated elderly gentleman, with a straggling beard, armed with a little hammer, who goes about the country indiscriminately tapping rocks and piling up immense collections of specimens of the remains of " prehistoric " animals to which he attaches barbarous names. And the importance of the hammer to the geologist is emphasised by the title facetiously applied to themselves by the geologists of the past, namely " Brethren of the Hammer."

If, however, we turn to early books on Field Geology, published as long ago as the seventies of the last century, we find that in specifying equipment, the authors give pride of place, not to the hammer, but to the map as the first piece of equipment in the list, as for example, A. Geikie's *Outlines of Field Geology*. A geologist should have more than a passing acquaintance with maps, both topographical and geological: he should be an expert in reading them, and he should have a clear understanding of their potentialities and limitations, and it is the purpose of what follows to dilate somewhat on the subject of maps, drawing attention to some aspects of the subject which are perhaps not familiar to everyone.

In the first place, it is well to have a clear idea of what we understand by a map, and what we expect to find thereon.

A map is a conventionalised picture, drawn in the form of a plan, on a reduced scale, of part of the surface of the earth. A map should show, in as great detail as the exigencies of the scale permit, natural and artificial features in their correct relation to one another, and in their correct relative size. It should show their positions not only in plan, but also (preferably by contouring) their vertical heights above sea level. And, since nature is beautiful, a map, in so far as it depicts natural objects, should be a thing of beauty. That the latter requirement has long been realised is shown by the following quotation from Gibson's edition of Camden's *Britannica*, published in 1722: " Yet it is much to be wish'd that due Encouragement might be found for some skilful and diligent hands to take new Surveys . . . . in order to one fair Body of Maps; so fair, with regard to the Letter, and so disentangled with regard to the distances of the Names from each other as to be not only useful, but easy and delightful to the eye."

In Great Britain, we are fortunate in possessing an old-established Ordnance Survey, which provides us with an unrivalled choice of topographical maps in various styles and on a number of different scales.

In general, our Ordnance Survey Maps, when depicting other than built-up areas stand up well to the test of being "delightful to the eye"; built-up areas are generally the reverse of beautiful, and they are shown on the maps in appropriate fashion.

In addition to the maps of the Ordnance Survey, there are numerous maps, generally on a scale of less than one inch to the mile, issued by various publishers. Many of them fulfil the conditions suggested above for a good map; others are purely "functional", and are designed for use by the not inconsiderable number of folk who are too indolent to learn how to use a general map and too ignorant to appreciate its worth.

The geologist requires a map on which to plot his observations, for in this way his work gains precision, and as he gradually builds up a geological map of the district which he is studying, his grasp of the structure becomes more definite. Moreover, without a map, he cannot, without intolerable waste of words, convey to others the results of his work, nor can he appreciate the work of his confrères in districts with which he himself is unacquainted.

The geologist is therefore concerned primarily with fixing his position accurately; he requires not only to know the exact locality of a point of observation in plan, but also in altitude. It is therefore profitable to consider the question of position in some detail; but before doing so, it will be well to have a clear idea of what scales of map are available.

Ordnance Survey Maps.

Three useful handbooks are issued by H.M. Ordnance Survey, dealing respectively with the Large-Scale, Intermediate-Scale and Small-Scale maps, covering the following series:

Large-Scale. 1/2500, or nominal 25-inch plans, which cover all parts of the country where man-made features or cultivation predominate; they stop only at mountains and moorland, for which the scale of survey was 6-in. per mile. These plans are not contoured, but are provided with many spot-heights. The amount of detail which can be shown is evident.

1/1250, or nominal 50-inch plans, covering built-up areas only. The chief gain in detail consists in substituting actual names for more general terms such as "Inn" or "Club".

Intermediate-Scale. 1/10560, or six-inch maps, covering the whole of the country and contoured at a vertical interval of 100 ft. Some have interpolated contours at 25 ft. vertical interval. This is the base-map which is used by the Geological Survey for mapping generally. In certain important areas, notably the coalfields, re-surveying on the 25-inch scale is being carried out. With the exception of some of the roads in built-up areas, all ground features shown are correctly to scale.

1/25,000, the so-called 2½-in. map. This is a useful new scale, and is now available for most of the country. Whereas maps on larger scales are in black and white, the 2½-in. map is coloured. Contours (at 25 ft. vertical interval) are brown; water and wet marshland are blue; the more or less "natural" features of the countryside, such as woods and boundaries between fields, are pale grey, while "artificial" features such as roads, buildings, orchards and trees in parklands have black margins. "A" and "B" class roads (Ministry of Transport) are coloured full brown and interrupted brown respectively, while unclassified roads, tracks and footpaths are uncoloured.

Small-Scale. These maps include the 1-inch, half-inch, quarter-inch and 1/625,000 (so-called tenth-inch) series. The 1-inch is the only scale which is likely to be used by the geologist, and it is too well known to require description.

The latest editions of all Ordnance Survey maps are over-printed with the National Grid.

Some Limitations.

The amount of detail which can be shown on a map obviously depends upon the scale; the smaller the scale, the less the detail, and the larger the minimum size of any object which can be shown without exaggeration. Also, the smaller the scale, the greater is the need for conventional representation.

Thus, for example, on scales below 6-in. to the mile, churches are shown by conventional signs; on the half-inch, all churches are shown by a cross; on the one-inch and 2½-in. churches are divided into three categories according as they have tower, spire or neither; on the six-inch and larger scales, churches are indicated by the ground-plan and the name and there is no indication of whether there is a tower or spire; on the six-inch scale, lines for the transmission of electricity are shown in detail, individual pylons being marked in their correct positions. On the one-inch and 2½-in. scales, transmission lines are shown, but pylons are indicated only conventionally save where changes of direction take place.

Exaggeration on Small-Scale Maps.

A line 1/200 in. wide represents 26.4 ft. on a one-inch map. We may take it that the minimum width *on the map* between two such lines bounding a strip, such as a road, must be 1/100 in. Therefore, including the thickness of the bounding lines, no road less than 1/50 mile or 106 ft. wide, can be shown without exaggeration on a one-inch map. Thus roads, which are important features on all maps, must be exaggerated in order to make them sufficiently prominent to be appreciated.

As an example of the exaggeration on the one-inch and 2½-in. maps, the following experiments are instructive. The first method is to enlarge a grid square (1 sq km.) by means of a Romer to a scale of 6-in. to the mile, and then to photograph it so that the side of the square becomes 2¼ in. This method of enlarging which is familiar to all, is difficult to practise. It is practically out of the question to enlarge the finer detail, consequently the smaller buildings, trees and contours which are shown on the original map may be omitted. Moreover, the skill of the draughtsman has a very important bearing on the results obtained.

The next method is more satisfactory. To produce it, the same square of the one-inch map is enlarged by using an epidiascope; the image of the square is received on a piece of drawing paper, the enlargement being about thirteen diameters, the details are drawn in with a pencil, inked in, and the final picture is made by reducing photographically to a square of 2¼ in. side. By this method of enlargement, all the details can be enlarged and their correct relative sizes are maintained, and it is quite easy to trace in the contours, which are difficult to introduce by the ordinary method of enlargement. Even at first sight, the roads appear to be much too wide; they are, in fact, little more than country lanes, and by measuring the apparent width of the road in one specific case, we find that according to the one-inch map, the road here is 181 ft. wide!

The third experiment shows the effect of applying the same process to the identical square of the 2½-in. map, the final reduction being to a square of side 2¼ in. as before. A good deal more detail is shown; there are many more trees, one or two extra tracks, but the important point is that the exaggeration of the width of the roads is less; near the point previously selected for example, the road is now shown as 60 ft. wide, which is still unexpectedly wide for a country lane.

Finally, we can make a direct photographic reproduction on the same scale as the others of the identical square from the six-inch map. The trees are much more abundant, and much smaller than on the reproductions of the 1-in. and the 2½-in. maps. Also, the lane near the place already considered is now found to be 20 ft. wide, and is therefore not exaggerated.

The exaggeration of the width of a road on a one-inch map is of little importance to the walker, motorist or cyclist, who are primarily interested in distance *along* the road: provided a road can be readily seen on the map and identified, nothing else matters. The geologist, however, is not so easily satisfied, for it is evident that a point on the one-inch map which appears to be on the edge of a road may, in fact, be 60 feet away and out in the middle of the next field. This distance of 60 ft. is about the limit of accuracy which can be attained in *plotting* a position on a one-inch map, for a legible pencil-line has a thickness of between 1/100 and 1/50 in., or between 52.8 and 106 ft. On a six-inch map, the uncertainty would be reduced to somewhere between 9 and 18 feet.

It comes as something of a shock to realise that to " pin-point " a position on a one-inch map, an error of anything up to ten yards in a lineal measurement will have inappreciable effects in the final plotting. Furthermore, if a position is to be found by compass, if the length of the sight be one mile, an error of one degree in a bearing would only result in the final position being misplotted by a distance equal to about half the width of a country lane as shown on the map; the probable error in protracting the bearing on to the map might easily be as much.

On a six-inch map, of course, more accurate measurement is necessary; say, to two yards linear, and to one degree in bearing. Shorter sights are permissible, because the error of plotting is reduced as the distance on the map increases.

There is one defect which, unfortunately, is common to maps on all scales, and that is that they are all more or less out of date; some are very deficient in recent detail, some less so; it all depends on the extent to which the area mapped has suffered from development within the past twenty or thirty years.

Retrenchment of expenditure resulting from the application of the " Geddes axe " about 1919-1920 hit the Ordnance Survey hard, and although the Davidson Committee which reported in 1938 recommended drastic re-organisation and revision of the 25-inch plans, which are the basis of our published maps, events from 1939 to 1945 prevented the recommendation being carried out, so that it is only now that thorough revision is being put in hand.

Fortunately, it is possible to obtain aerial photographs of many parts of the country on a scale which is very close to 6 in. to the mile, and, where these can be used, it is not difficult to introduce recent detail into a six-inch map. It is disconcerting to find that an arterial road giving good sections is not shown on one's six-inch map, and it is quite likely that quarries which have been recently in active work are either not shown at all or have grown out of all recognition. Of course, given time and an elementary knowledge of plane surveying, it is possible for the geologist to introduce the necessary detail, although the process may not be easy, particularly where enlargement of a quarry is concerned. By the use of the appropriate aerial photographs, however, addition of detail to a six-inch map becomes little more than a matter of tracing the extra lines and then transferring them to the map. An example of this is Butts Quarry, near Ashover, Derbyshire.

Selection of Scale for Use in the Field.

For geological mapping, the six-inch map is necessary and, for most purposes, is adequate. Occasionally, where it is desired to map very fine detail, such as a plexus of dykes, or when zoning a sedimentary formation closely, a 25-inch plan may be necessary, but these occasions are comparatively rare.

At the same time, despite the limitations of the one-inch and 2½-inch maps, neither of these smaller scales should be despised by the geologist. The " run " of the features of the countryside can be appreciated more readily by the aid of a 2½-in. or a one-in. than on a six-inch map, for the area which can be seen at a glance is strictly limited. Moreover, the closer contouring on the small-scale maps draws attention to the shape of the ground better than the more open contour-interval on the six-inch map In carrying out a preliminary reconnaissance of a piece of country before starting the actual geological mapping, a 2½-in. map is very valuable, and enables the observer to obtain a better mental picture of the topography than he could derive from the larger-scale map.

It is profitable also, while mapping is proceeding, to transfer the boundary lines from the six-inch field map to a 2½-in. sheet, which may be coloured as the work proceeds.

Geological Maps.

A geological map should show:—

(i) *The topography* of the country as fully and as accurately as is consistent with the scale of the map.

(ii) *All geological formations*, which appear at the surface, with their boundary lines accurately traced and their relation to the form of the ground clearly indicated.

(iii) *All igneous rocks*, effusive being distinguished from intrusive.

(iv) *The geological structure* of the region, that is, the relation of the rocks to each other, their inclination from the surface, their curvatures and dislocations. Dip arrows should be inserted wherever possible to show exactly the direction and inclination of the strata.

(v) *Economic information*, such as the nature and distribution of the soils, the position of available building materials, the direction, thickness and extent of ores, coal seams and useful minerals, the best sources of water-supply etc., should be included.

How much of the above information can be given depends on the scale of the map. Except for the coalfields, the normal scale for geological mapping is six inches to the mile, and of publication one-inch. Here, it may be interesting to remark that from its inception, and for many years afterwards, the function of the Geological Survey was to colour geologically the one-inch maps produced by the Ordnance Survey, and for some years after the primary geological mapping was carried out on six-inch Ordnance maps, the avowed object was merely to produce maps which could be reduced to the one-inch scale. Six-inch mapping in fact was regarded as a means to an end, and not as an end in itself.

How much information is lost as the result of reducing a six-inch map to the one-inch scale depends on the structure of the ground mapped; if this is simple, the one-inch may be almost as informative as the six-inch map. This point is well brought out by comparing parts of the "Dartford" Sheet of the one-inch series with corresponding quarter sheets of the six-inch map.

On the other hand, if we compare the one-inch map of the Ashover area in Derbyshire with the six-inch, there is considerable loss, for the dip arrows and the values of the dip which are given on the larger scale map are wanting on the one-inch. And where the geological relations are more complex, the loss is far greater.

The important point to remember is that there is no inherent advantage in a large-scale as opposed to a small-scale geological map; every problem must be considered separately.

If we are interested in the general geology of, say, the neighbourhood of Lyme Regis, then the appropriate one-inch sheet of the Geological Survey leaves little to be desired. If, on the other hand, our concern is with the zones of the Lias in that district, then Lang's map, on a scale of 24 in. to the mile becomes necessary. The smaller the scale of the map, the greater must be the cartographic unit.

The general geological map of the British Isles on a scale of 25 miles to the inch gives an excellent general idea of the areas occupied by the various systems of sedimentary rocks, and it also indicates where the large masses of igneous and metamorphic rocks are to be found. It gives no information about the topography of the country, and were it not for the table showing the colours which represent the various systems, no idea of the structure of the British Isles could be arrived at. The general (in England) south easterly dip of the rocks can only be inferred; the scale is too small to permit of the insertion of dip-arrows. The map is nevertheless very valuable, and, provided the limitations are borne in mind, conveys useful information in general terms.

The 10-mile (so-called) geological map, whose scale is really 1/625,000 gives rather more geological detail, but little topographical information. It is not until we reach the scale of one inch to the mile that there is any information provided which relates the geology to the shape of the ground.

In the "old series" geological maps, relief of the ground is shown by hill-shading and, for the most part, the geological lines were plotted directly on the one-inch maps. The "new series" maps are contoured and are reductions (in so far as the geological work is concerned) from the primary survey on a scale of six inches to the mile.

Having regard to the limitations under which they worked, we can only stand amazed at the accuracy and detail which the old surveyors attained. Their published maps, which are hand-coloured, worthily fulfil the requirement that a map should be a thing of beauty. In this respect, they often excel the colour-printed products of recent years. The relation between topography and geology is often more evident on the maps of the old series than on those of the new, for it is generally very difficult to pick out the contours on the later maps, particularly where, as frequently happens, the geological colouring is heavy.

One feature is common to all the geological maps on the one-inch scale, namely the exaggeration of faults, mineral veins and dykes, which are generally shown over 100 ft. in width. Some exaggeration is, of course, inevitable, otherwise these important items in the make-up of the country would scarcely be detected on the map.

The Care of Field Maps.

Even a quarter-sheet of a six-inch map is an unwieldy affair to handle in the field, therefore it is usual to cut each quarter-sheet into four equal rectangles, 9 in. by 6 in., and to carry these in a special map-case. Before cutting the sheet, one meridian of longitude should be inked in with a *fine line* on each sixteenth-sheet (or *slip*) to serve as a reference-line when taking bearings. Also, if the sheet be gridded, the numbers of the grid-lines should be neatly written in alongside them in fine figures, within the " frame ". The margin of the map can then be cut off with a sharp knife, and the map divided (also with a sharp knife) into four quarters. On the back of each slip, the designation thereof should be written, giving the name of the county, the number of the sheet, and the position of the quarter-sheet and of the individual slip. Thus, we might have " Derbyshire, 29. (N.E./S.W.)".

When using the field-map, the utmost care must be taken to keep it clean and neat. It should be carefully protected from rain; the geologist should see that, in showery weather, *whatever gets wet, his map does not.*

All entries which are made on the field-map must be inserted *in the field*, and at the time when the observations are made. This refers not only to marking the positions of exposures and the like, but also to the drawing of boundary-lines. It is often tempting to alter the position of a boundary after one arrives home in the evening, because something may not look quite right. The temptation is insidious and should be resisted; the ground should be revisited, and any rectification should be carried out with the evidence in full view.

All notes on the map should be inked in in legible and neat lettering in the evening, after returning from the day's work. After this, all pencil marks should be carefully erased, otherwise, they are liable to become fixed and more difficult to remove. If, on further consideration, a boundary-line seems as though it may require revision, the doubtful length may be allowed to remain in pencil until the ground can be revisited.

Remember that a field-map is *a unique production*. It is true that it can be copied, but a copy has never the same authenticity as the original which was drawn on the ground. The field-map should be regarded *as an end in itself* and not as a means to an end.

Reports on Temporary Geological Sections in the Society's Area.

THE following reports on temporary geological sections have been selected from those received, and are the first to be published in the *London Naturalist*. Details of reports received but not published are retained by the Recorder and copies will be sent to H.M. Geological Survey.

The active co-operation of more members prepared to undertake the investigation and description of temporary sections is invited. Newcomers will be given all the assistance that they require. They will, however, be responsible for their own sections and the results of their work may well prove of great value in future geological research. A temporary section undescribed is lost to science for ever.

The thanks of the Society are due to members and others who have forwarded reports, also to the owners, owner's architects and contractors who so readily granted permission for sections on their properties to be examined and recorded. The architects' drawings so generously presented to the Society and the help received with every kind of information have also been greatly appreciated.

M. Ainsley, *Recorder for Temporary Sections.*

LONDON E.C.

L.N.H.S./T.S./1/49. London E.C.1.

Holborn Viaduct. Excavation for building foundations. Area bounded by Farringdon Street, Holborn Viaduct, Shoe Lane and Charterhouse Street. Formations examined: (a) Alluvium; (b) London Clay.

(a) *Alluvium.* In the lowest 3 feet this was a clay with some pebbles and above this it was a gravel with a clayey matrix. Organic remains and sporadic fragments of brick occurred in all parts and the mineral Vivianite was abundant. The alluvium was capped by made ground. In a digging at approximately the middle of the E. side the made ground contained part of a lens of clay with its base sloping to the east and suggesting a considerable flood in the river Holebourne. The deposit was later than 15th Century.

(b) *London Clay.* A stiff blue clay weathering brown, with septarian nodules arranged in definite layers and with small fragments of concretionary pyrite. The only fossils obtained were a piece of pyritized wood and a fragment of *Natica* sp. The dip of the clay, based on the lines of septaria, was estimated as 3° 15′ (± 15′) in a direction 2° E. of South (± 2°), i.e., the line of Charterhouse Street is not quite a strike section.

Along the N. boundary of the site the eroded surface of the London Clay sloped down from approximately 18 feet below pavement level on the W. side to about 18 feet lower at a point 55 feet along the boundary. The surface was not, however, even, and in other parts of the site considerable irregularities were observed. In the S.W. corner of the site the London Clay was overlain directly by made ground.

Note.—Records of trial borings carried out for the architects were kindly supplied by the contractors and are now deposited with the Recorder for Temporary Sections.

JOHN F. HAYWARD.

L.N.H.S./T.S./2/49. LONDON E.C.2.

BANK BUILDINGS, OLD JEWRY. Excavation for building foundations. Area bounded by Old Jewry, Lothbury, Princes's Street, Grocer's Hall and No. 11 Old Jewry.

Formations encountered:—(a) River Gravel—with running water (mapped by Geol. Surv. as Flood Plain Gravel); (b) London Clay.

The following data were obtained from site records:—

Trial working at S.W. Corner (related to empirical datum point at street level).

	Feet
Made Ground	14
Gravel	11
Brown Clay with Sand	1 grading into
Blue Clay (with some unidentified "pebbles" in top 6 inches).	
Solid Blue Clay at	40 below street level.

The blue London Clay had scattered septarian nodules, which were particularly abundant in the S.W. part of site. The Gravel consisted of worn flint pebbles of maximum size about 1 inch with a matrix of smaller pebbles and sand.

Trial working at N.W. Corner. Top of Gravel as above, but thickness of gravel was 12 feet, i.e., the top of the clay sloped down 1 foot to the N. The Gravel in the N.W. corner contained running water. An analysis of this on behalf of the owner's architects revealed, *inter alia*, the following data:

Hardness:	Temporary,	24 parts per 100,000
	Permanent,	27 parts per 100,000
Organic Matter,		5 parts per 100,000
pH 8.5		

JOHN F. HAYWARD.

L.N.H.S./T.S./3/49. LONDON E.C.4.

BRIDEWELL PLACE. Excavation for building foundations. Area bounded on E. by Bridewell Place, on S. by No. 8 Bridewell Place and extending approximately 65 feet to the W. of Bridewell Place The base of the site was at 8.87 feet, Newlyn Datum, and all measurements are related to this datum.

Formations examined: (a) Alluvium; (b) London Clay.

(a) *Alluvium Deposits.* Black alluvium mud with high gravel and sand content and abundant organic matter. In places it contained shells of marsh-loving mollusca, bones (mammalian and avian) and seeds. The mineral Vivianite occurs in the Alluvium. In addition, a small pocket a few millimetres across was found to contain acicular Calcite. This deposit was apparently laid down largely during historic times since a piece of pottery of probable date 1670-80 was found low down in the S.E. corner. Immediately above the London Clay in the S.E. corner was a layer containing chalk fragments.

(b) *London Clay.* Encountered in trial pits along E. face of site as follows:—

Distance from Wall of No. 8 Bridewell Place.			Depth (referred to Newlyn Datum).	Description of Clay.
	Feet	Inches	Feet	
A.	13	6	−3.8 N.D.	Brown grading into darker brown.
B.	36	0	+0.11 N.D.	do.
C.	65	0	+1.7 N.D.	do.
D.	81	0	+3.8 N.D.	Yellow Clay grading into brown.
E.	91	0	+5.23 N.D.	do.

Trial Pits along South side of site :—

Distance from pavement.				
	9	0	See "A" above	
F.	54	0	+2.1 N.D.	do.

Blue Clay was obtained at depth by auger borings from the base of Pit A. The clay, with septarian nodules, was found at the surface over most of the N.W. part of the site.

JOHN F. HAYWARD.

LONDON W.C.

L.N.H.S./T.S./4/49. LONDON W.C.2.

22/23 ESSEX STREET, STRAND. Borings for Concrete Piles. The following section is based on information supplied by the contractors. Measurements from street level at bottom of steps.

	Feet	
Rubble,	15	(approx.)
Brown Clay,	17	(approx.)
Blue London Clay,	3+	

Bones found by the workmen are supposed to have come from the Rubble (i.e., made-up ground) and have not yet been determined.

B. AINSLEY.

L.N.H.S./T.S./5/49. LONDON W.C.2.

77/91 NEW OXFORD STREET. Excavation for building foundations Area bounded on the W. by Earnshaw Road and on the N. by New Oxford Street. At a point 40 feet E. of Earnshaw Road and 45 feet S. of New Oxford Street the following section was visible:—

Bed			Feet	Inches
		Rubble	12	0
1		Ferruginous Sand	1	6
2	(Sample)	Clay Parting	0	1
3		Ferruginous Gravelly Sand	1	8
4		Ferruginous Sand	2	0
5	(Sample)	Fine Yellow Gravel	2	10
6	(Sample)	Coarse Sandy Gravel	1	0
7	(Sample)	Fine Sandy Gravel	1	6
8		Sand in Lenticles of Gravel	1	9
9		Ferruginous Layer	0	1
10		Brown Clay	1	3
11		Blue London Clay (with Septarian nodules)	3	0+

The above section is a typical one on this site. The thickness of the various beds differs from point to point, and beds 6 and 7 are repeated in one place. In the North part of the site beds 6 and 7 contained black-stained gravel, but this was probably due to the presence of an ancient sewer or conduit still visible in the S.E. corner of the site. Bed 5 (Fine Yellow Sand) was predominant, and in places replaced the gravel or occurred above and below the gravel. The Brown Clay (bed 10) was irregular at the top with all the beds from 9 to 5 resting on it at different points. Bunter Quarzite was observed (not *in situ*).

B. Ainsley.

LONDON S.E.

L.N.H.S./T.S./6/49. London S.E.1.

Waterloo. National Grid Ref. 308802. Excavation for erection of Concert Hall for the 1951 Exhibition. Area approximately 264 feet by 220 feet and up to 22 feet in depth. Situated between Belvedere Road and the River Thames on the Waterloo Bridge side of Hungerford Bridge.

The following beds were shown to be present:—

	N.-W. end		S.E. end	
	Feet	Inches	Feet	Inches
(e) Made Ground	6	0	6	0
(d) Alluvium Clay and Silt	4	8	16	0
(c) Fine Yellow Sand and Sandy Gravel	8	6	(absent)	
(b) Gravel—clean well rounded pebbles	3	0	10	0
(a) London Clay	10	0+	10	0+

(a) *London Clay* was not seen at any point in the excavation, but was shown to be present by trial borings at about 18 feet below Newlyn Datum, as indicated in the drawing kindly supplied by the Chief Architect to the London County Council. These drawings are now deposited with the Recorder for Temporary Sections.

(b) Only about 1 foot of the *Gravel* was visible but it is shown in the L.C.C. drawing as resting directly on the London Clay. Described on the drawing as "blowing gravel," it consists of clean, well-rounded and sub-angular pebbles, mainly flint but including some quartzite.

(c) The fine *Yellow Sand* overlaid the gravel at the river end of the section. It contained lenticles of small angular pebbles which varied in size but were all about the same size in any one lenticle. The sandy beds generally were banked up at a high angle (up to about 45°) towards the river, becoming coarser at the base as the river was approached, until the lower 3 or 4 feet consisted of a coarse gravel containing angular pebbles up to 2 inches in size. A fall in the bedding " downstream " was observed. On the N.E. face a " V " shaped channel was noted, filled with ferruginous gravel and lumps of brown clay, cutting into the top of the sandy beds (but not present in the overlying clay). A similar channel was also seen in the N.W. face but here smaller in size. Probably both channels represent the course of a small flood-stream which drained the marshy ground lying behind the sand bank.

(d) The *Alluvium Clays and Silty Beds* extended over the whole area, resting on the sandy beds near the river and on the Gravel (bed " b ") at the S.E. end of the section. They comprise a series of black, brown, blue and green clays with black predominant. They are only 4 feet 8 inches thick at the river end, but increase suddenly to about 16 feet near the centre of the section and replace the sandy beds in the S.E. half. A bed of Peat approximately 1 foot 6 inches in thickness was a conspicuous feature in the clay beds in the S.E. half of the area, and no doubt represents the edge of a marsh extending in that direction and cut off from the river by the sand bank.

(e) The *Made Ground* at the top of the section consisted of about 6 feet of brick rubble, soil, etc., and contained old clay pipes, pottery, bones and some shells.

The assistance of my wife and Messrs C. N. Carreck, A. G. Davis, S. E. Ellis and J. F. Hayward is gratefully acknowledged.

B. Ainsley.

Notes on the Holocene and later Mollusca.

Flood Plain Gravels (beds "b" and "c"). No mollusca were noted except in the smallest of the two channels a solitary example of *Viviparus viviparus* (Linné) was collected (C.N.C.).

Alluvium Clay (bed "d"). Black Thames mud with much drift wood, branches, sticks, etc. Peaty and silty in parts. The silty parts often showed whitish streaks, the former existence of shells. Shell lenticles, as such, were absent. Samples of the streaked silt were broken down with difficulty, but the shells were extremely fragile and very few perfect examples could be extracted. Remains of *Chara* and *Hazel Nuts* were present together with a few *Ostracods*. A vertebra of a fish (? *Esox*) was found.

Mollusca:—*Valvata piscinalis* (Müller), rare; *Bithynia tentaculata* (Linné), common; *Theodoxus fluviatilis* (Linné), rare; *Limnaea pereger*

EXPLANATION OF PLATES.

PLATE 1. Waterloo. Concert Hall Site (LNHS/TS/6/49). Part of N.E. face (Belvedere Road end) showing made ground resting on Alluvium Clay. The black Peat bed may be seen in the lower half. Note the base of Shot Tower (behind the tree) and buildings on the N. bank of the River Thames beyond.

PLATE 3. Holborn Viaduct (LNHS/TS/1/49). Part of lens of Alluvium Clay (later than 15th century) in made ground.

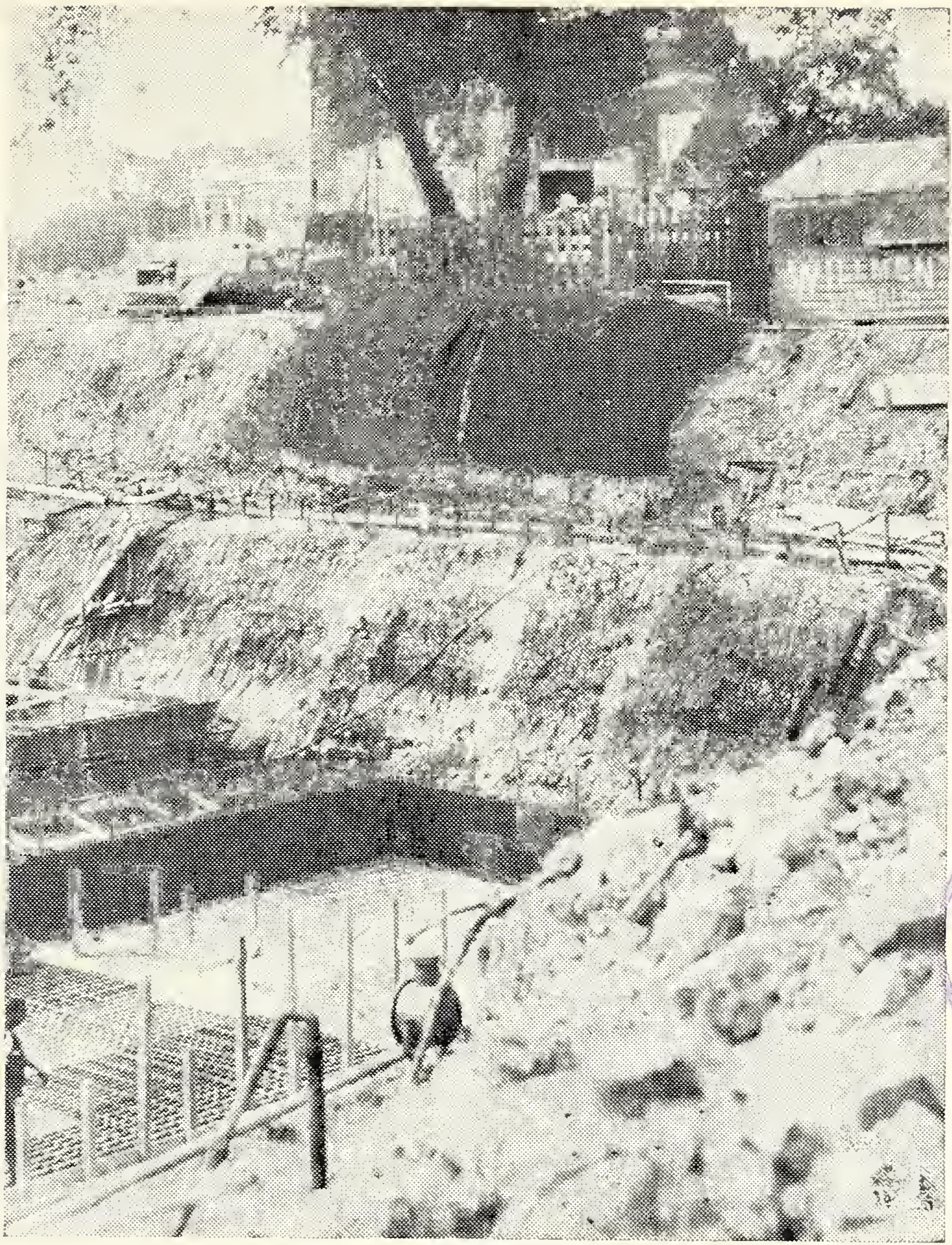

Fig. 1.

BRITISH MUSEUM NATURAL HISTORY

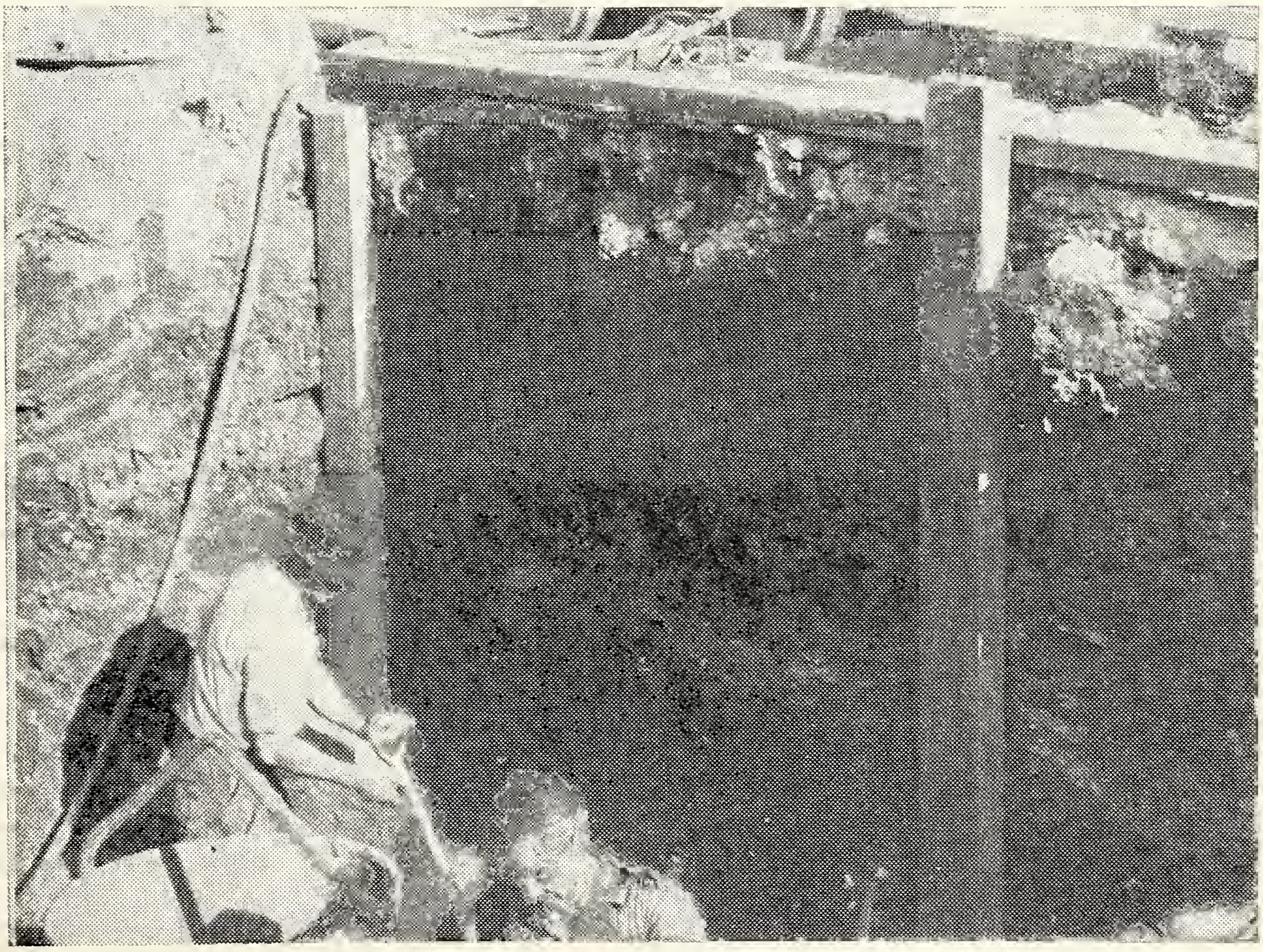

Fig. 3.

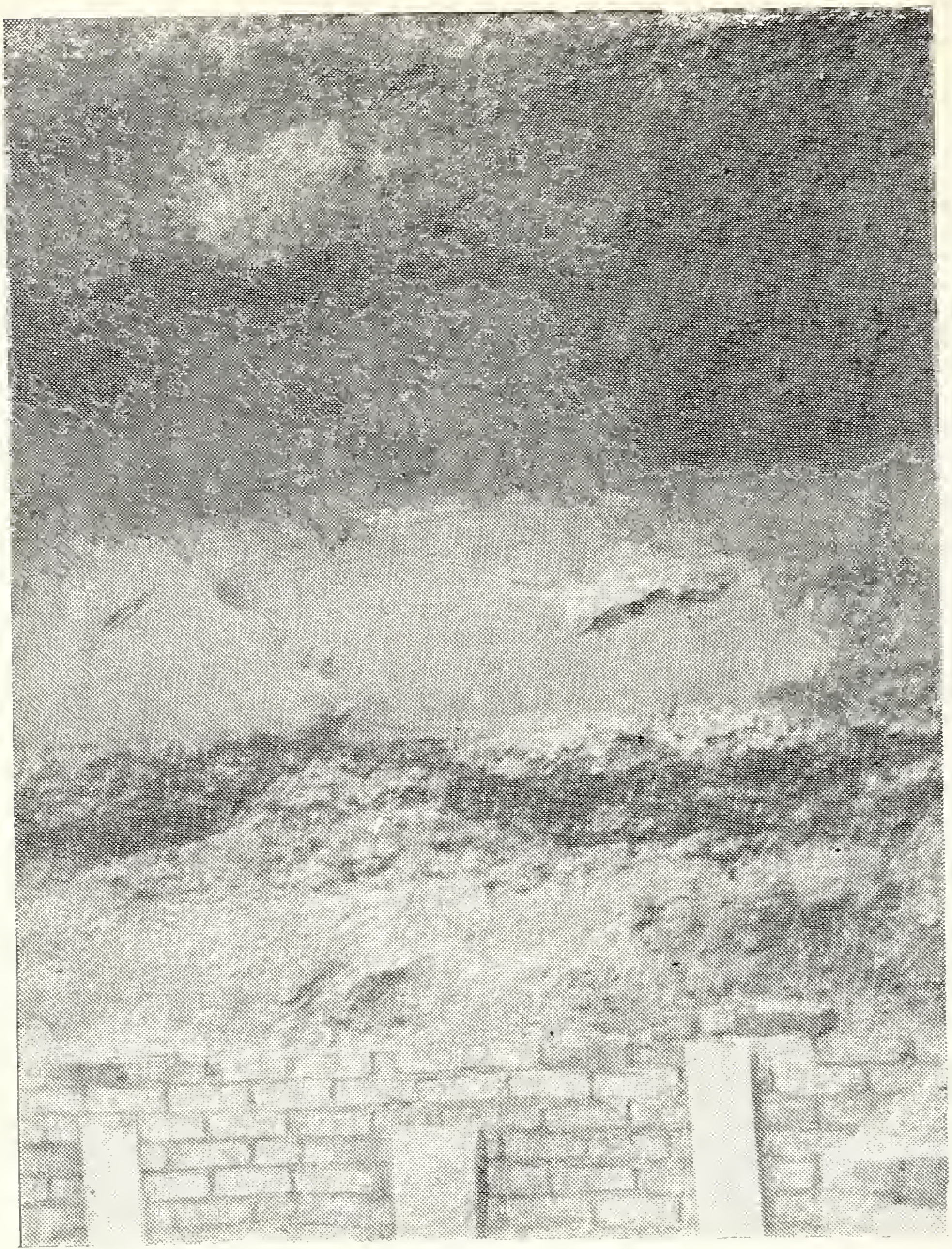

Fig. 2.

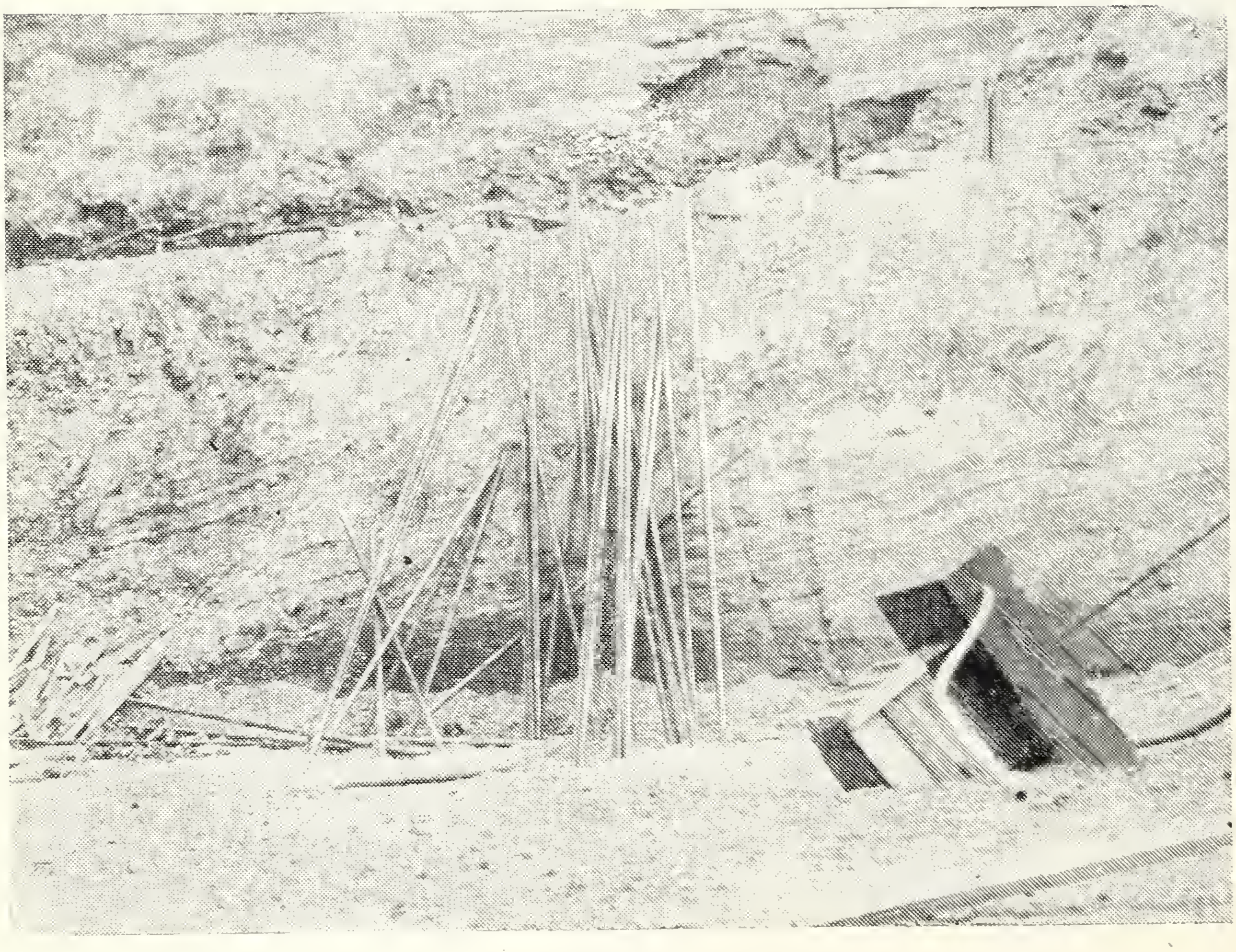

Fig. 4.

(Müller), frequent; *Planorbis complanatus* (Linné), rare; *Pisidium* sp., rare; *Succinea* sp., indet., rare; *Goniodiscus rotundatus* (Müller), rare; *Laciniaria biplicata* (Montague), one example.

The black mud and peat may represent a backwater choked up with vegetation stripped from the higher reaches in times of flood. Shells were not abundant for the water was no doubt stagnant and foul with decaying vegetation and timber. The land species belong to riverside haunts and timber. *Laciniaria biplicata*, one of our most localized British species, is a riverside dweller, and still lives at high water mark at Barnes Bridge (A.G.D., 1949). It is recorded from the Holocene of Reigate, Hitchen, Walton Heath (Hill washes), Fulham and Blackfriars (Thames deposits).

Made Ground (bed "e"). Roman, Post-Roman, Medieval Soil, made ground, rubble, etc., much disturbed. Above the Alluvium Clay (Black Thames Mud) was a foot or so of compressed soil or earthy material containing shells. The presence of *Sphaerium rivicola* (Lamarck) indicates Roman age or a little later. Periodical flooding left quantities of *Valvata picinalis* (Müller), *Bithynia tentaculata* (Linné) together with lesser quantities of *Viviparus viviparus* (Linné), *Limnaea pereger* (Müller), *L. trucatula* (Müller), *Planorbis complanatus* (Linné), *Pisidium amnicum* (Müller), *Pisidium* sp., *Goniodiscus rotundatus* (Müller) and *Trochulus hispidus* (Linné).

In the more disturbed layer at the top occurred most of the above species in a jumble of bones, sherds and pottery—the debris of Roman to historic times. Flooding accounts for the abundance of freshwater mollusca while a lush waterside flora must be supposed to support such a damp-loving species as *Arianta arbustorum* (Linné).

It would be difficult to find any of the species here recorded at the present time; as a habitat for mollusca it was destroyed by the growth of London.

A. G. Davis.

Notes on the Presence of Freshwater Mollusca in Lime Concrete.

During the demolition of buildings on this site rafts of concrete foundations had to be removed. They were up to 3 feet in thickness and were so tough that mechanical aids were used to break them up. A hand sample of the concrete on examination showed that shells composed part of the aggregate and when broken up yielded a dozen or more shells per sample. The following species were identified:—*Valvata piscinalis* (Müller), *Bithynia tentaculata* (Linné), *Viviparus viviparus* (Linné), *Theodoxus fluviatilis* (Linné), *Limnaea pereger* (Müller), *Planorbis complanatus* (Linné), *Pisidium amnicum* (Müller), *Pisidium* sp.

EXPLANATION OF PLATES.

PLATE 2. 77-91 New Oxford Street (LNHS/TS/5/49) showing beds 1 to 7 of section described.

PLATE 4. Waterloo. Concert Hall Site (LNHS/TS/6/49). Part of S.W. face (river end) showing Alluvium Clay (bed "d") resting on steeply banked sandy gravel (bed "c").

Photos by John F. Hayward.

The shells were dredged from the river with the ballast used as aggregate. Architect's specifications of the period (1800-1840) stipulated Thames ballast from above Blackfriars Bridge, that taken from below the bridges was considered too foul for the purpose and useless (see Davy, C., p. 168). The shells after their long stay in concrete show no signs of stress and look as fresh as recent specimens just gathered.

A. G. Davis.

Notes on Sands from Bed "C."

Sample No. 1. From S.W. end of Section. A lenticle of coarse regular sandy flint gravel (84% coarser than 30 mesh). Only 2% passes 60 mesh; this includes heavy residue and clay, each about .001%. The portion between 30 and 60 mesh consists of very well rounded quartz; the sand passing 60 mesh, of rather angular grains with some felspar. The heavy residue consists almost entirely of quartz and flint coated with limonite.

Sample No. 2. From N.W. side of Section. Mainly a fine sand (88% between 30 and 60 mesh, mainly well rounded quartz), 8% (containing much well rounded quartz), passes 60 mesh, of which clay and heavy residue are each about 0.25%. The heavy residue consists mainly of limonite-stained flint and limonite grains (? Ooliths); the heavy mineral assemblage proper includes much zircon (often idiomorphic), tourmaline (brown, rounded but often freshly fractured), garnet (pink, well rounded), kyanite (cleavage fragments) and collophane* (ranging from isotropic to biaxial—with R.I. ranging from 1.53 to 1.62, and showing structures suggestive of bones and teeth). Also present, but more scantily, are staurolite, rutile, fluor and cassiterite.

While no definite deductions can be made as to provenance, the general character suggests ultimate derivation from the Permian of the West of England, except for the collophane, the origin of which is still a mystery.

S. E. Ellis.

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Kennard, A. S., and Woodward, B. B. 1922. The Post Pliocene Non-Marine Mollusca of the East of England. *Proc. Geol. Assoc.*, Vol. xxxiii, p. 126.

L.N.H.S./T.S./7/49. London S.E.1.

Waterloo Station, York Road. Excavation for escalators in connection with the 1951 Exhibition situated under York Road nearest to the main entrance to S.R. Windsor lines.

The following section is based on information supplied by the contractors:—

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*To be described in *Min. Mag.*, Vol. (1950), by S. E. Ellis and G. F. Claringbull.

	Feet	Inches
Made Ground	8	2
Brown Sandy Clay	6	7
Green Sandy Clay	4	1
Coarse Gravel	3	8
Sandy Gravel	7	6
Brown Clay	14	0
Dark Brown Clay	10	0
Blue (London) Clay	7	0+

There was no opportunity to examine the section, but a great deal of the material excavated was dumped on the site. A number of fossils were obtained with the assistance of my wife and also Miss M. W. Reed, Messrs J. N. Carreck, A. G. Davis and J. F. Hayward. These have been determined by Mr A. G. Davis and his report is given below.

B. Ainsley.

List of Fossils from the London Clay, Waterloo Station Shaft.

The stiff greyish clay present was characterized by flattish septarian nodules. Fossils were scarce and in the following list many of the records are based on single or fragmentary individuals.

The total assemblage is typical of A. Wrigley's 2nd Faunal Division = 100′-200′ above the base of the London Clay. The index fossil of this division, *Balanocrinus subbasaltiformis*, was extremely rare.

- Foraminifera.
  - *Nodosaria* sp. indet.
  - *Dentalina communis* d'Orb.
  - *Lenticulina cultrata* (Mont.).
  - *Cornuspira involvens* Reuss.
- Actinozoa.
  - *Graphularia wetherelli* M. Edw.
- Echinodermata.
  - *Balanocrinus subbasaltiformis* (Miller).
  - *Coelopleurus* sp. (spines, etc.).
  - *Spines* sp. indet.
  - *Ophioglypha* cf. *wetherelli* (debris).
  - *Ophioglypha* sp. (portion of arm).
  - *Rhizocrinus londinensis* (Forbes).
- Annelida.
  - *Ditrupa plana* (J. Sby.).
- Lamellibranchia.
  - *Pteria papyracea* (J. de C. Sby), common.
  - *Nuculana amygdaloides* (J. de C. Sby.).
  - *N.* cf. *oblata* (Wood).
  - *Nucula* sp. indet.
  - *Arca* (*Trigonodesma*) *impolita* J de C. Sby.
  - *Nemocardium nitens* (J. Sby.).
  - *Abra splendens* (J. de C. Sby.), common.
  - *Teredo antenautae* J. Sby.
  - *Pinna affinis* J. Sby., frequent
  - *Modiola* sp. indet.
  - *Pitaria* sp. indet., fragments.
- Scaphopoda.
  - *Dentalium anceps* J. de C. Sby.
  - *D. nitens* J. Sby.
- Gastropoda.
  - *Turbonilla tenuiplicata* Edw. M.S
  - *Euspira glaucinoides* (J. Sby.).
  - "*Cassis*" *striata* J. Sby.
  - *Plychatractus interruptus* (Pilk.).
  - *Pleurotoma* sp. indet.
  - *Bullinella* sp.
- Pisces.
  - Scales and debris indet.

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A. G. Davis.

ESSEX.

L.N.H.S./T.S./8/49.

Epping Upland. Epping Green, Near Epping Upland. Map 6″ Essex (New Series), Sheet N LI SE. A quadrilateral area contained approximately by National Grid Refs. 436050, 441051, 433055, 437057. Excavation for drains. Deposits: Chalky Boulder Clay.

Actual trenches were examined in two places to a depth of approximately 10 feet and revealed about 6 inches of made ground underlain by Boulder Clay. Freshly-cut section showed a stiff blue clay streaked with white. It crumbled rapidly on weathering and abundant erratics were collected from the weathered material.

Erratics (identified in hand specimens only).

		Probable Source.
Sandstones.	Carboniferous.	Coal Measures and Millstone Grit.
Quartzites	Triassic.	Bunter.
Limestones and Oolites.	Jurassic.	
Septaria.		? Oxford Clay.
Sandstones.	Cretaceous.	?Lower Greensand.
Chalk (striated pebbles and Chalk flour)		Chalk.
Unworn flints		Chalk.
Septaria.	Tertiary.	?London Clay.
Flint Pebbles.		Pebble Gravel.
Schist.	Unidentified	

Fossils: *Gryphaea obliquata* (L. Lias), *Gryphaea dilatata* (Oxford Clay), Belemnites including *Pachyteuthis* cf. *abbreviata* and *P.* spp., cf. *Passaloteuthis* sp. (Lias) and cf. *Actinocamax* sp. (Chalk). A specimen of *Pachyteuthis* cf. *abbreviata* from this site has been presented to the British Museum (Natural History) and bears the registered number C42932.

Note:—Samples of the erratics are retained by the undersigned and are available for examination.

John F. Hayward.

MIDDLESEX.

L.N.H.S./T.S./9/49.

Northwood, Middlesex. 6 inch, 9 N.E.E. In Copse Wood on the north side of Duckshill Road, Northwood, and opposite Mad Bess Wood is an area of woodland, just below the 300 ft. contour in which Mr F. E. Wrighton detected a heath flora, thus suggesting a sandy subsoil. A geological map of this ground shows London Clay with a thin wash of gravel. Further investigation located an old bomb crater in which a large quantity of sand and gravel was observed. With the cooperation of Mr V. Stanyon of Battle of Britain House the hole was cleaned up and the following section exposed:—

	Feet	Inches
Soil	0	3
Subsoil of sandy clay with many rounded and sub-angular flints	1	3
Brown pebbly brickearth	0	9

Grey clay with inclusions of red clay, chalk, quartz and flint pebbles	1	9
Brown sand with horizontal and vertical streaks of grey-white sand	2	0
Coarse red-brown sand with many large and small flint pebbles and unworn flints	2	0
Grey-green sandy clay	1	0
Stiff grey clay	1	0

The extent of this deposit of bedded sand clay and gravel is being investigated.

S. W. Hester (Ruislip Natural History Soc.)

L.N.H.S./T.S./10/49.

Ruislip, Middlesex. 6 inch, 10 N.W.W. Trench on the north side of and approximately parallel to the River Pinn between St Martin's Approach and Fore Street, Ruislip, showed the following section:—

	Feet	Inches
Stiff grey-brown clay	2	6
Black laminated clay with shattered bleached flints and some wood at base	2	0
Dark brown loam with large fragments of wood and some gravel	2	3
Small gravel in loam cutting into the bed above	3	6+

The gravel seen in the bottom of the trench is river gravel indicating a previous course of the Pinn. Subsequent silting or a slight uplift produced a land surface of which the bleached flints are evidence. Vegetation then became established to form the bed of peaty clay. Oak and birch are among the specimens of wood found in this bed. Marshy conditions then appear to have become predominant, probably due to a further slight subsidence, and the top bed of marsh clay contains less vegetable matter.

S. W. Hester (Ruislip Natural History Soc.).

The following Reports are retained by the Recorder in manuscript form:—

London.

L.N.H.S./T.S./11/49. N.W.2. National Grid. Ref.: 227864, 228864, 230864. Number of sections in Dollis Hill Lane, Cricklewood (P. F. Timson).

L.N.H.S./T.S./12/49. N.W. 2. National Grid Ref.: 235862. Cricklewood Broadway. Outside Railway Institute, opposite Smith's Works (P. F. Timson).

L.N.H.S./T.S./13/49. S.E.5. Denmark Hill, at junction with Sunray Avenue. Trench section (M. Kerney).

L.N.H.S./T.S./14/49. S.E.6. Catford, Rushey Green by Brownhill Road. Road tunnel (Miss M. W. Reed).

L.N.H.S./T.S./15/49. S.W.17. Tooting, off Graveney Common. Trench (M. Kerney).

Surrey.

L.N.H.S./T.S./16/49. Morden, in Sandbourne Road (H. R. M. Young).

The Butterflies of London and its Surroundings

By C. G. M. de Worms, M.A., Ph.D., F.R.I.C., F.R.E.S.

No comprehensive survey of the Lepidoptera of the London district appears to have been undertaken for some fifty years. In 1898 the former City of London Entomological Society published, under the authorship of Dr F. J. Buckell and Mr L. B. Prout, a general list of the Lepidoptera included in an area covering a radius of ten miles from St Paul's Cathedral. Since that date the population and the built-up area of Greater London have roughly doubled, thereby bringing about many changes in the habitats of insect species. It therefore seems highly desirable that a further up-to-date review of London and its surroundings should be initiated and the Butterflies, the most popular and attractive group of our insect fauna, naturally call for priority.

For the purpose of the present survey of the natural history of this region, the London Natural History Society have fixed an arbitrary boundary of a radius of twenty miles from St Paul's Cathedral. This large area of some 1260 square miles is four times that covered by the 1898 list. The present area embraces the whole of the county of Middlesex (designated in this paper as M.21) and portions of six other Vice-Counties, as follows:—The southern portion of Hertfordshire (H.20) and that of North Essex (E1.19), the south-west corner of South Essex (E2.18), the north-west portion of West Kent (K.16), the northern area of Surrey (S.17) and a small part of eastern Buckinghamshire (B.24).

All this region is exceedingly rich in types of terrain affected by many of our more local species of Lepidoptera. Of the 68 Butterflies recognised as being indigenous in this country or as regular or occasional migrants the London Area can boast to-day of *fifty-six* species comprising 47 resident breeding species, 3 regular migrants, the Painted Lady (*Pyrameis cardui*), the Clouded Yellow (*Colias croceus*) and the Pale Clouded Yellow (*Colias hyale*), and 6 irregular migrants, the Queen of Spain Fritillary (*Argynnis lathonia*), the Camberwell Beauty (*Nymphalis antiopa*), the Long-tailed Blue (*Lampides boeticus*), the Monarch or Milkweed (*Danaus plexippus*), the Swallow-tail (*Papilio machaon*) and the Bath White (*Pontia daplidice*). There are also old records of a species extinct in the British Isles, the Black-veined White (*Aporia crataegi*). The Large Blue (*Maculinea arion*) was reported to have been taken in Hertfordshire last century, but there is no recent record. The 1898 list referred to above only recorded 39 species for the area it covered.

In such a large area the ecology and the correlation of different groups of butterflies with special types of environment is of special interest. The various kinds of terrain and the insects associated with them are largely governed by the prevailing geological strata. The London Clay is the predominating feature in the area under review, especially north of the Thames. On this heavy soil have grown up such fine expanses of forest as that of Epping. It is also mainly responsible for the many fine oak woodlands which surround the northern perimeter of the Metropolis. In Herts we find many excellent collecting localities of this nature, such as Chorley Wood near Rickmanworth, the Whippendell Woods near Watford, Bricket and Aldenham Woods in that region, the woodlands round Hoddesdon and Essendon, and, nearer London itself, Oxhey Wood and Copse Wood in Middlesex. South of the River in Kent we have such famous old-time localities as Darenth and West Wickham woods, Joyden's Wood, Bexley as well as Pett's Wood, Chislehurst and Abbey Wood, Greenwich. In Surrey the chief area of oak woodland is Prince's Coverts, Oxshott. All these fine localities harbour the many wood-loving species of butterflies such as the Fritillaries, the Ringlet, the White Admiral and the Purple Emperor.

In the southern half of the Area are to be found the chalk downs extending from Kingsdown in the east through such choice collecting spots as those near Eynsford and Shoreham to Reigate and then onwards to Boxhill, while further north we have an offshoot round Epsom, Chipstead and Banstead. This terrain is associated with the down-loving species such as the Chalk-hill and Adonis Blues (*Lysandra corydon* and *L. bellargus*), the Duke of Burgundy Fritillary (*Hamearis lucina*) and the Marbled White (*Melanargia galatea*). In the south-west of the Region we have the Bagshot Sand, mainly a large tract of heathland round Oxshott, Cobham and Weybridge, on which breeds the attractive little Silver Studded Blue (*Plebeius argus*). There is now little marshland, except along the fringe of the Thames estuary. In the immediate vicinity of the Metropolis are many ideal localities for our Lepidoptera, especially in the south-west, such as Wandsworth and Wimbledon Commons. On the latter more than half the macro-lepidoptera on the British list have been recorded. Richmond Park, too, is the haunt of many very local species.

What of the past history of the London region compared with the present-day distribution of Butterflies? It is only within the last two hundred years that the study of British Lepidoptera has become popular or systematised. During the latter part of the eighteenth century and the start of the nineteenth we are able to obtain from the many notable works produced and from the observations of such famous naturalists as Doubleday an insight into the changes in the occurrence and distribution of the various species. This has often been brought about by destruction of their favoured haunts. Many famous localities for collecting on the outskirts of London have long since disappeared or have been very much damaged. Among the former, Hackney marshes and Battersea Fields were well-known butterfly haunts in the 18th century. J. Stephens, writing about 1830, says that the Swallow-tail (*Papilio machaon*) was often taken at Stepney and Peckham, while Edward Newman in the 1820's often found larvae of this species on Meadow Rue (*sic*) at Tottenham Green.

But a question immediately comes to mind, has the butterfly population and number of species appreciably decreased in the last half century as the Great City steadily spreads its tentacles and swallows up further favoured haunts? In spite of this steady encroachment, I feel confident that on the whole there is little change in the status of London's lepidoptera and that very few species have been lost in recent years, though naturally changes in distribution are inevitable. The Swallow-tail appears to have been lost as a breeding species, while the Wood White (*Leptidea sinapis*) which was common in Doubleday's time in Epping Forest, and even lurked in that vicinity till the 1880's, has apparently only just found its way back within the Area, and it is to be hoped that it will one day firmly re-establish itself within the London boundary. Similarly the Heath Fritillary (*Melitaea athalia*), recorded at Tottenham by Wilkes in 1745 and also occurring in Epping Forest in the 1820's, disappeared from these regions for nearly a century, and it is welcome news to know that it has recently re-appeared on the borders of Middlesex and Herts.

It will be seen that London has lost hardly any resident species, at least during the last fifty years. In fact, there is evidence of the steady spread of many local species, even within the confines of Inner London (I.L.), designated on the Society's map as an area of 40 square miles, extending five miles from north to south and eight miles from east to west with its centre at St Paul's. Here in Parks, squares and gardens lepidopterous life abounds, but is often much overlooked. The bomb damage of the late War has done London lepidoptera a good turn, as most of the bombed sites have become overgrown with vegetation very favourable to our insect fauna. Buddleia bushes have sprung up in incredible quantity. These attract all manner of butterflies and it is sometimes an amazing sight in the heart of London to watch Tortoiseshells, Peacocks and Red Admirals by the score jockeying for a good berth on the fragrant spikes. At least 18 species of Butterflies have been recorded as residents of or regular visitors to the Inner London Region.

The 1898 list enumerated only 39 species of our butterflies recorded within a radius of 10 miles of St Paul's Cathedral. It is of interest to compare some of these records with those of the present-day distribution of some of the more local resident species found in the London area which have not been treated already. One of the insects whose occurrence and distribution seems to have fluctuated considerably in the past hundred years is the Speckled Wood (*Pararge aegeria*). In 1898 it is reported as "scarce: formerly common." In fact, it was abundant in Epping Forest and in other parts of Essex in 1868. Now it seems to be spreading considerably again in the north-west of the area and more especially south of the Thames, where in recent years it has established itself firmly in north Kent and has even penetrated to the south-east of that county. In 1898 the Small Meadow Brown (*Maniola tithonus*) was recorded as "disappearing: formerly common." It occurred then at Croydon, Wimbledon and Kilburn. Though this insect is widespread on the outer areas round London, it appears to have deserted its former haunts nearer the heart of the Metropolis. A similar record as a disappearing species is given at the end of the last century to the Ringlet (*Aphantopus hyperanthus*) reported in those days from Croydon, where it may still be found, though Surbiton seems its nearest to central London at the present time. It is very abundant in all woods in the outer area of the district. The Grayling (*Eumenis semele*) and the Marbled White (*Melanargia galatea*) are not on the 1898 list, but both seem to be well established locally, mainly in Kent and Surrey, and to be increasing their range.

Among the Nymphalinae the Comma (*Polygonia c-album*) calls for special attention. It was hardly known in London fifty years ago. Its spread from the west during the last thirty years has been spectacular, and it is now one of the commonest of this group all over the Area and even in Inner London. Another species of particular note is the Large Tortoiseshell (*Nymphalis polychloros*). This is an insect of great fluctuations. Formerly it was a regular suburban insect, having been recorded several times from the City in the latter part of last century. For some reason, possibly due to the onset of parasites, it almost disappeared from all its former haunts and until quite recently was one of our rarest resident species. However, it is gradually re-establishing itself, and in 1948 there were many records within the Society's boundary. The three Large Fritillaries, the Silver-washed (*Argynnis paphia*), the High Brown (*A. cydippe*) and the Dark green (*A. aglaia*) occurred, according to the 1898 report, as near central London as Hackney for the first two insects, while the Dark green had been taken at Croydon, near which it is still found; the other two now only occur in the larger woods in the outlying areas. Of special interest is the White Admiral (*Limenitis camilla*), not included in 1898, which has steadily extended its habitats in cover to London in recent years, even appearing on Wimbledon Common. There is only one record of the Purple Emperor (*Apatura iris*) in 1898, from Woodford. This king of our butterflies was a former inhabitant of Epping Forest in Doubleday's time, but it is gratifying to know it has been seen on the southern border of the area and it is likely to appear in many other large oak woods in the Area. The Marsh fritillary (*Euphydryas aurinia*) is another welcome newcomer to the northern part of the district after an apparent long absence. Among the Blues the Chalk-hill (*Lysandra corydon*) and the Adonis (*L. bellargus*), recorded in 1898 from Croydon, still occur near that area and are very widespread in all suitable spots along the Surrey Downs. The same applies to the Small Blue (*Cupido minimus*). The Silver-studded blue (*Plebeius argus*) does not appear in the 1898 record, and is now only found on the most southerly and easterly limits of the Society's area. The Holly Blue (*Celastrina argiolus*) has always been a denizen of the Metropolis and often abounds in the suburbs. Among the Hairstreaks, the Purple (*Thecla quercus*) is described in 1898 as rare, formerly abundant. It is now very plentiful in most oak woods, especially in Kent and Surrey.

The Brown Hairstreak (*Thecla betulae*) has reappeared in Kent. It was formerly a regular inhabitant of Epping Forest a hundred years back. Of the Pieridae (the Whites) the Orange tip (*Euchloë cardamines*) seems to be spreading generally nearer the centre of London. In 1898 it was recorded from Isleworth, Bedford Park, Hampstead, and Chiswick. Among the Hesperidae (the Skippers) the Dingy Skipper (*Erynnis tages*) was taken at Finchley in the 1890's, while the Grizzled Skipper (*Hesperia malvae*) is recorded from Wimbledon Common, where it is still plentiful. The Pearl Skipper (*Hesperia comma*) is still found at Croydon, which was its only locality in 1898.

Next the migrant butterflies call for special note. Among the regular immigrating species to these Islands we have the Painted Lady (*Pyrameis cardui*), which often invades this country in huge numbers and has been seen all over the London area, right into the Metropolis, as was the case in 1947 and 1949. Of the Clouded Yellows *Colias croceus* is another regular visitor, often producing a huge progeny in this country. In the amazing year, 1947, it reached record numbers for the present century and found its way to all parts of the London Region. There were many instances of it in the Central Area, especially in the London Parks. The Pale Clouded Yellow (*Colias hyale*) is a far less frequent visitor, though it has been recorded repeatedly in the London area during its years of plenty, notably also in 1947, and it is possible that the newly-recognised third species (*Colias calida*) may have often occurred in the area and been overlooked.

Among the rarer migrants the most noteworthy and spectacular is unquestionably the Camberwell Beauty (*Nymphalis antiopa*), which has occurred according to the records at least 26 times within the London area since 1900, and during the latter part of the last century was often taken well into the suburbs. There is a solitary record in 1937 of the Milkweed (*Danaus plexippus*), the large exotic-looking species from North America which is said to fly the Atlantic. The Queen of Spain Fritillary (*Argynnis lathonia*) has apparently only visited the Area once this half century, in 1934. In that famous migrant year 1945 the Bath White (*Pontia daplidice*) invaded this country in large numbers, and also visited the London region when there were five records, and a further one in 1946. In 1945 also another very rare migrant, the Long-tailed Blue (*Lampides boeticus*), found its way into the London area. Five were taken that season, while the most recent capture is of a single example in 1949 at Streatham.

Of the species which have apparently become extinct within the Area during the past hundred years, there is evidence that the Black-veined White (*Aporia crataegi*) was seen in Epping Forest in the 1840's, while there seems to be an authentic capture of a Large Blue (*Maculinea arion*) in the 1880's near Haileybury, where three further specimens were seen in 1898.

In the accompanying chart I have denoted the occurrence of the respective species in each of the seven Vice-Counties as well as from Inner London.

+ indicates that there is evidence that the species is resident in the area or has migrated there a reasonable number of times in recent years.

(+) denotes that it formerly occurred in the Vice-County, but there appear to be no recent records of its existence. A bracketed species indicates that it is apparently generally extinct in the London Area, while an asterisk shows that the species was included in the List of London Lepidoptera compiled in 1898 by the City of London Entomological Society. The order in which the species are placed is largely that adopted by the International Committee on Nomenclature published in 1934, while the Nomenclature is that used in the Index Check-List of British Lepidoptera produced by Mr I. R. P. Heslop in 1947. Finally I must express my extreme appreciation and thanks to all who have assisted me in supplying valuable data which has enabled me to prepare this account of London's Butterflies. In particular, I am deeply indebted to Mr P. W. E. Currie for his invaluable help in card-indexing large numbers of records for the Area covering the past twenty years which have been sent in by the following keen observers and recorders, to whom also I offer my warmest thanks:—

Mr H. Attlee, Miss P. C. Bain, Lt.-Col. G. F. Bensley, Mr S. R. Bowden, Mr K. E. Braid, Dr F. R. Browning, Mr J. F. Burton, Mr K. R. Chandler, Dr J. S. Carter, Mr C. L. Collenette, Mr A. D. Falconer, Mr R. S. R. Fitter, Mr K. P. Keywood, Dr Garrett Jones, Mr A. Kidner, Mr G. Locket, Miss C. Longfield, Mr E. L. Martin, Mr I. Menzies, Mr P. Michael, Mr D. F. Owen, Mr E. G. Pedler, Mr A. D. Russwurm, Mr J. M. Saunders, Mr R. Smith, Mr E. R. Speyer, Mr B. R. Stallwood, Mr D. H. Sterling, Mr F. A. Swain, Mr B. M. Price-Thomas, Miss B. A. Thorn, Mr C. Vallins, and Mr W. Williams.

Capt. Dannreuther, R.N., also sent in most useful records about the recent occurrence of the various migrant species.

Much valuable information has been obtained from the well-known works on the British Lepidoptera, as well as from the leading Entomological Journals and from the Proceedings of County Societies, notably the *Essex Naturalist* and the *Transactions of the Hertfordshire Natural History Society* which contains the exceptionally comprehensive list of the county's lepidoptera published in 1937 (Vol. xx, p. 223) by Dr A. H. Foster. Mr R. S. R. Fitter's admirable work on London's Natural History has also been the source of much helpful information, especially about London and its surroundings.

CHART OF THE DISTRIBUTION OF THE BUTTERFLIES OCCURRING IN THE LONDON AREA SINCE 1900 (INCLUDING EXTINCT SPECIES).

	I.L.	M.21.	H.20.	E2.18.	E1.19.	K.16.	S.17.	B.24.
SATYRIDAE.								
*_Pararge aegeria_	–	+	+	(+)	–	+	+	–
*_Pararge megera_	+	+	+	+	+	+	+	+
Melanargia galatea	–	–	–	+	–	+	+	–
Eumenis semele	–	+	+	+	–	+	+	–
*_Maniola tithonus_	–	+	+	+	+	+	+	–
*_Maniola jurtina_	+	+	+	+	+	+	+	+
*_Coenonympha pamphilus_	–	+	+	+	+	+	+	+
*_Aphantopus hyperanthus_	–	+	+	+	–	+	+	–
NYMPHALIDAE.								
Argynnis euphrosyne	–	+	+	+	–	+	+	–
Argynnis selene	–	–	+	+	–	+	+	–
*_Argynnis aglaia_	–	+	+	+	–	+	+	–
*_Argynnis cydippe_	–	+	+	+	–	+	+	–
*_Argynnis paphia_	–	+	+	+	–	+	+	–
Argynnis lathonia	–	–	–	–	–	–	+	–
Melitaea athalia	–	+	–	(+)	–	–	–	–
Euphydryas aurinia	–	–	+	(+)	–	–	+	–
*_Vanessa atalanta_	+	+	+	+	+	+	+	+
*_Vanessa cardui_	+	+	+	+	+	+	+	+
*_Aglais urticae_	+	+	+	+	+	+	+	+
*_Nymphalis polychloros_	+	+	+	+	–	+	+	–
*_Nymphalis antiopa_	+	+	+	+	–	+	+	–
*_Nymphalis io_	+	+	+	+	+	+	+	+
*_Polygonia c-album_	+	+	+	+	+	+	+	+
*_Apatura iris_	–	–	(+)	(+)	–	–	+	–
Limenitis camilla	–	+	+	+	–	+	+	–
LYCAENIDAE.								
*_Cupido minimus_	–	–	+	(+)	–	+	+	–
[_Maculinea arion_]	–	–	(+)	–	–	–	–	–
Plebeius argus	–	(+)	–	+	–	+	+	–
*_Aricia agestis_	–	+	+	+	+	+	+	+
*_Polyommatus icarus_	–	+	+	+	+	+	+	+
*_Lysandra corydon_	–	–	+	(+)	–	+	+	–
*_Lysandra bellargus_	–	–	–	–	–	+	+	–
*_Lampides boeticus_	–	+	–	–	–	+	+	–
*_Celastrina argiolus_	+	+	+	+	+	+	+	+
*_Lycaena phloeas_	+	+	+	+	+	+	+	+
*_Callophrys rubi_	–	+	+	+	+	+	+	+
*_Thecla quercus_	–	+	+	+	+	+	+	–
Thecla betulae	–	–	–	(+)	–	+	–	–
Strymonidia w-album	–	–	+	(+)	–	+	+	–
DANAIDAE.								
Danaus plexippus	–	+	–	–	–	–	–	–
PAPILIONIDAE.								
Papilio machaon	–	(+)	–	(+)	–	+	–	–
PIERIDAE.								
*_Pieris brassicae_	+	+	+	+	+	+	+	+
*_Pieris rapae_	+	+	+	+	+	+	+	+
*_Pieris napi_	+	+	+	+	+	+	+	+
Pontia daplidice	–	+	+	–	–	+	+	–
*_Euchloë cardamines_	+	+	+	+	+	+	+	+

	I.L.	M.21.	H.20.	E2.18.	E1.19.	K.16.	S.17.	B.24.
[*Aporia crataegi*]	–	–	–	(+)	–	–	–	–
Leptidea sinapis	–	–	(+)	(+)	–	–	+	–
**Colias croceus*	+	+	+	+	+	+	+	+
**Colias hyale*	–	+	+	+	–	+	+	–
**Gonepteryx rhamni*	+	+	+	+	+	+	+	+
RIODINIDAE								
Hamearis lucina	–	–	+	(+)	–	+	+	–
HESPERIDAE								
**Erynnis tages*	–	+	+	+	+	+	+	+
**Pyrgus malvae*	–	+	+	+	+	+	+	+
**Thymelicus sylvestris*	–	+	+	+	+	+	+	+
Thymelicus lineola	–	–	–	+	–	+	–	–
**Hesperia comma*	–	–	–	–	–	+	+	–
**Ochlodes venata* (*Augiades sylvanus*)	+	+	+	+	+	+	+	+
Resident and regular migrant species	18	40	43	39	25	50	51	23
Species apparently extinct or not recorded since 1900 [Bracketed]	–	(2)	(3)	(12)	–	–	–	–

The abbreviations above have the following designations:—

I.L. =Inner London.
M.21 =Vice County of Middlesex.
H.20 =Vice County of Hertfordshire.
E2.18=Vice County of South-west Essex.
E1.19=Vice County of North-west Essex.
K.16 =Vice County of Kent West.
S.17 =Vice County of Surrey North.
B.24 =Vice County South-east Buckinghamshire.

PART II.

In this section is given an account of each of the 56 species of Butterflies found in the London Area together with those that are now extinct. In most instances the name of the observer or recorder is given after a record from any special locality, and I have given special emphasis to records of the more recent years. Those which have been gleaned from the literature have the reference given in many cases. The List of Hertfordshire Lepidoptera compiled by Dr A. H. Foster in 1937 and published in the *Journal* of the Hertfordshire Natural History Society for that year is indicated by the abbreviation, Foster, *Lep. Herts.*, 1937. Similarly the list of Essex Lepidoptera by Mr Fitch appearing in the *Essex Naturalist* of 1891 is referred to as Fitch, *Essex Nat.*, 1891.

I have endeavoured to divide the records under the headings from each county so as to facilitate reference to the occurrence of any particular species within the area. I am fully aware that there may be many more records from new localities which will be eagerly welcomed, together with additional observations in the years to come of the fluctuations in numbers and distribution of the respective species.

SATYRIDAE.

The first Family of our Butterflies to be reviewed is the *Satyridae*, commonly known as the Browns, though it also includes the Marbled White. Of the 11 species on the British list eight are found in the London Area. With the possible exception of the Ringlet, all the species affect open country and are for the most part very widespread over the British Isles. All their larvae feed on different types of grasses.

**Pararge aegeria* Linn.—M.21, (E2.18), H.20, K.16, S.17.

The Speckled Wood is a rule the earliest of the New Year's species. It is often on the wing by the end of March in woodlands and shady lanes which are its chief haunts. As already mentioned, its status in the London Area has changed appreciably in recent years as well as its range in the Southern Counties, where it has now reached the borders of Suffolk and penetrated into East Kent. Further afield it extends its range to Western Scotland and is widely distributed in Ireland. In the London Area it has increased in the south, but apparently disappeared from some localities in the northern part of the region.

From SURREY it is reported as often seen on Wimbledon Common and plentiful in 1936 and 1939 on Wandsworth (R. Smith) and Mitcham Common (Sterling). In the woods of the Oxshott district over 1000 were counted in 1947 (Stallwood). It is quite numerous in Richmond Park (Collenette). It is abundant on Bookham Common (Garrett Jones) and widely distributed throughout the Epsom area (R. Smith).

In MIDDLESEX it has been seen as near Central London as Twickenham where two were noted in a garden in April 1946 (Stallwood), and it has also been observed in the Whippendell Woods near Northwood in 1945 (Martin).

In HERTS it has been seen near Haileybury (B. Thorn) and was common at Whippendell Wood, Watford, in 1934 (Foster, *Lep. Herts.*).

From KENT it was seen commonly in 1947 round Westerham, near Shoreham and Eynsford, in Joyden's Wood, at Keston, and on Hayes Common, though none were observed in 1946 in spite of thorough search (Owen). Small numbers were noted at Biggin Hill in 1947 (Burton).

In ESSEX it was formerly found round Brentwood, but disappeared about the beginning of the century (Williams).

**Pararge megera* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Wall Brown is closely allied to the Speckled Wood, but appears later in the season and usually produces two clear-cut broods in May and August and occasionally a third in October. It is in some years very common throughout the southern part of the British Isles. It has the habit of affecting dry spots in woods and open country, fluttering up and down roadways and settling on walls and stones. It is often very abundant and generally distributed in the London Area. It has been recorded from SURREY as common at Oxshott, especially in 1947

(Stallwood), also round Arbrook, Claygate and Esher (Keywood) and on Bookham Common (Garrett Jones). Widespread in the Boxhill district and round Epsom (Menzies). Numerous in Richmond Park (Collenette).

In INNER LONDON it was seen in St Paul's Churchyard in May 1949 and in August of that year in Cannon Street (S. W. Swain, *Entom.*, 82, 1949, 212). In October 1947 it was observed in Aldersgate Street (Easterling, *Entom.*, 82, 1949, 116).

MIDDLESEX. It occurs round Harrow and Northwood (Martin) and near Ealing and Acton, though scarce in 1946 (R. Smith).

ESSEX. Recorded from Purfleet (Bowden). Generally distributed.

HERTS. It is found round Broxbourne (B. Thorn) and Cheshunt (Speyer) and widespread in the county.

KENT. It has been seen commonly in the Lewisham district, round Hayes, Blackheath and Sundridge Park, also abundant at Shoreham, Eynsford and near Otford, in 1947 (Owen), and in the Pett's Wood area (F. Swain).

Eumenis semele Linn.—M.21, H.20, E2.18, K.16, S.17.

This very active butterfly, the Grayling, is a denizen of downlands, cliffs, sandhills and heathlands throughout the British Isles, though it is more localised in the North of Scotland. It is a most variable insect, producing different forms according to the type of terrain on which it occurs. Those found on chalk downs are usually larger and brighter than the races found on the large tracts of heath, especially in the Southern Counties. It appears in late July and has the tantalising habit of settling on the ground at an oblique angle where it is very difficult to see and then flies up swiftly again, settling again a little distance away. It has only a limited distribution in the London Area, mainly on the chalk downs and heaths.

SURREY. Very abundant at Colley Hill in 1945 where it outnumbered many common species, whereas in 1943 only two were seen in this locality. Numerous on the downs round Boxhill. Common on the heaths round Oxshott (Menzies) and on Wisley Common in 1944 and round Surbiton Golf Course in 1946 (Stallwood).

KENT. Abundant in 1946 and 1947 on Hayes Common, Dartford Heath, Keston Common, also round Shoreham, Eynsford, Otford (Owen). Common in Darenth Wood and round Blackheath in 1947, but it was not seen before this date in the Chislehurst area. It definitely shows signs of spreading in North-West Kent (Burton).

In HERTS. it is reported as "very rare on Haileybury Heath" (Foster, *Lep. Herts.*, 1937).

Melanargia galatea Linn.—E2.18, K.16, S.17.

The Marbled White is our only representative of a group of which there are a further seven species in Western Europe. It appears in late July and is often extremely abundant where it occurs, mainly in colonies on downlands and on the borders of woods. It is essentially a southern insect, not having been recorded much north of the Midlands. It has only a very restricted range in the London Area, though it is likely there are localities where it is still to be found.

SURREY. One seen in 1949 at Hinchley Wood (Stallwood) and another by the River Mole at Cobham in August 1947 (Garrett Jones).

KENT. Occasionally seen, mostly as single specimens, in the Chislehurst Common area between 1932 and 1946 (F. Browning).

In ESSEX it is reported as local in the Brentwood area (Williams), but was common in the middle of the last century in Epping and Hainault Forests (Fitch, *Essex Nat.*, 1891).

**Maniola tithonus* Linn.—M.21, H.20, E2.18, E1.19, K.16, S.17.

The Gatekeeper or Small Meadow Brown is a summer inhabitant of our woods and lanes, appears in late July and often continues in one brood till late September. It likes shady clearings in woods where it can be seen flitting up and down rides and also along hedgerows, especially round gateways which has earned it the name of Gatekeeper. It ranges over the whole of England to the south-west corner of Scotland from which it has been recently recorded. It has been found almost everywhere in the London Area.

In SURREY, it is common at Banstead, Epsom, Chipstead (Menzies) and round Surbiton Golf Course and on Wisley Common, where it was abundant in 1945 and 1946 (Stallwood). Plentiful in most years round Oxshott and Ashtead (Sterling), and in 1944 on Epsom Common (Compston). In 1947 it was especially numerous on Bookham Common (Garrett Jones).

MIDDLESEX. It occurs at Ruislip and round Northwood (Martin) and was common in 1945 in the Uxbridge-Fulmer district (R. Smith).

In the corner of BUCKS it is common in the Fulmer district (R. Smith).

HERTS. Seen at Broxbourne (B. Thorn). Common at Hoddesdon and widespread in the woods of southern Herts (Foster, *Lep. Herts.*, 1937).

KENT. Abundant locally round Hayes Common, Lewisham area, Joyden's Wood and Dartford Heath, especially in 1947, and on the downs, but apparently absent from the woods round Otford, Shoreham and Eynsford (Owen). Seen in some numbers at Sundridge Park in 1947 (Burton) and in the Pett's Wood area (F. Swain).

In ESSEX it is reported as widespread and abundant in the Brentwood area and throughout the western part of the county (Williams).

**Maniola jurtina* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Meadow Brown is probably our commonest summer butterfly, appearing in the late June and continuing without a break until the early autumn but it is doubtful if it produces more than two generations. It is found all over the British Isles and almost every suitable type of habitat and terrain. In Scotland, and especially in Ireland, the orange colouring particularly in the female is very pronounced and bright. It is found all over the London Area, all through the suburbs and right into the central part of the City.

In Surrey, it is abundant on the downs round Banstead and Epsom (Menzies) and round Hinchley Wood where 1100 were seen in 1946 (Stallwood). Occasionally seen on Wandsworth Common, 1936-39 (Sterling). Abundant on Mitcham Common, New Malden and on Wimbledon Common (_Id._). Very numerous on Bookham Common in 1947 (Garrett Jones) and in most years in Richmond Park (Collenette). Some 1700 seen in an 8 mile radius round Oxshott in 1947 (Stallwood).

Middlesex. One observed chased by a sparrow along the Victoria Embankment in July 1947 (P. Michael). Often seen on waste ground at Shepherd's Bush and round Acton and Ealing (R. Smith).

In Kent it is very common in all suitable localities in the Lewisham area and around Blackheath, Greenwich and Bexley, and often seen on bombed sites. Unusually plentiful in this area in 1947 (Owen). It is generally distributed in the Bickley district and round Chislehurst, Hayes, Orpington and Keston (F. Browning).

It is generally distributed throughout Herts and Essex.

*_Coenonympha pamphilus_ Linn.—M.21, H.20, E218, E1.19, K.16, S.17, B.24.

The Small Heath is another very common butterfly appearing about mid-May and continuing in successive broods throughout the summer. It is found all over the British Isles in every kind of terrain. The Scottish race is appreciably yellower in ground colour than the southern forms. It is widespread all over the London area.

In Surrey it is very common round Banstead and Epsom (Menzies) on Wimbledon and Sheen Commons and in Richmond Park (D. King) and often abundant in the Surbiton and Hinchley Wood district (Stallwood). Often seen on Bookham Common (Garrett Jones).

In Middlesex it has been seen in numbers round Harrow, Ruislip, Chorley Wood, and less frequently near Northolt and round Hangar Hill (R. Smith).

From Herts it has been observed at Broxbourne (B. Thorn) and Cheshunt (Speyer). Generally distributed in the county.

In Kent it is widely distributed round Lewisham, Blackheath Shooter's Hill, and Eltham, especially common in 1947 (Owen) and plentiful in the Chislehurst area and at Shoreham at Otford, 1932-36 (Browning).

In Essex it is widespread throughout the western part of the county (Williams).

*_Aphantopus hyperanthus_ Linn.—M.21, H.20, E2.18, K.16, S.17.

The Ringlet is essentially a woodland species affecting shady glades and rides where it flutters lazily about the bramble blossoms during July. It is widespread all over England and a large part of Scotland where the race has a very grey instead of a rich brown underside. Sometimes the ringed spots are replaced by minute white dots, var. _caeca_. It is local but widely distributed throughout the London Area.

SURREY. Frequent on Epsom Downs, Colley Hill (Menzies), local on Bookham Common (Garrett Jones), and Claygate and Oxshott Common (Stallwood). Plentiful in 1946 at Caterham (B. Thomas), only seen three times in Richmond Park since 1932 (Collenette). Extending its range round Surbiton (Stallwood).

In HERTS it occurs in the Whippendell Woods in 1945 (E. Martin) and was seen at Watford (Saunders) and round Broxbourne (B. Thorn).

KENT. Local at St Paul's Cray (Browning) and in the Lewisham area, but abundant in 1946 in Joyden's Wood, in Darenth Wood round Otford, Shoreham, Farningham, and occurred for the first time on Hayes Common in 1947 (Owen). It is scarce in the Pett's Wood area (F. Swain), and has been seen round Biggin Hill (Burton).

In ESSEX it is common in the Brentwood area and the adjoining woods (Williams), and in 1860 was reported as common at Walthamstow (Fitch, *Essex Nat.*, 1891). It has been seen also near Purfleet (Bowden).

NYMPHALIDAE.

The large Family of the *Nymphalidae* undoubtedly provides the most spectacular of our Butterflies. It comprises the Fritillaries, the White Admiral, the Purple Emperor and the Vanessidae, viz., the Peacock, the Tortoiseshells, the Comma and allied species so familiar in our gardens. Of the 18 recognised British species, all but one, the Glanville Fritillary (*Melitaea cinxia*), have been recorded in the London Area.

**Argynnis euphrosyne* Linn.—M.21, H.20, K.16, S.17, E2.18.

The Pearl Bordered Fritillary and its close relative the Small Pearl-bordered are among our most delightful butterflies, as they sail gracefully up and down the rides and clearings of woods, often settling on bugle flowers to which they are very partial. The Pearl-bordered is the first of the fritillaries to appear, often coming on the wing at the end of April. It occurs locally all over England and well into the Scottish Highlands and in the West of Ireland. Its larva feeds on the dog violet (*V. canina*), hibernating when very small and feeding up in the early spring months. It occurs often abundantly in woods of the London Area.

In SURREY it is common in suitable spots round Epsom (Menzies) and in Ashtead woods in 1945 (Sterling). Abundant in Oxshott woods in 1948 and 1949 (C. de W.). Common on Surbiton Golf Course in 1947 (Stallwood) and a few seen at Caterham, Gravely Hill in 1946 (Thomas).

MIDDLESEX. Common in Copse Wood, Northwood, in 1946 (P. Bain) and at Ruislip Copse (Saunders).

KENT. Generally distributed, but not common round West Wickham, Chislehurst, Bickley and Shoreham (Browning). Fairly common in 1946 and 1947 in Elmstead and Joyden's Woods and in 1947 in Darenth Wood and on Hayes Common where it was the commonest butterfly (Owen), also seen in Pett's Wood (F. Swain).

In HERTS it is reported from Broxbourne (B. Thorn) and from many of the woods in the southern region, particularly Oxhey Wood, Bricket Wood, and near Radlett (Foster, *Lep. Herts.*, 1937).

From ESSEX it is common round Brentwood (Williams) and was abundant in Epping Forest and round Ongar Park Wood (Fitch, *Essex Nat.*, 1891).

Argynnis selene Schiff.—H.20, E2.18, K.16, S.17.

The Small Pearl-bordered Fritillary usually appears a fortnight later than its larger relative and occurs in almost the same localities, throughout the British Isles to Northern Scotland, but is unknown in Ireland. The larva feeds similarly to the last species. Curiously enough it seems much less widespread in the London Area than *A. euphrosyne.*

In SURREY second brood specimens were seen near Hinchley Wood in August 1945, and a few in Prince's Coverts, Oxshott (Stallwood).

In KENT it is generally distributed but not common in woods round Chislehurst and West Wickham from 1932 to 1946 (Browning).

In HERTS it is recorded as rare near Haileybury (Foster, *Lep. Herts.*, 1937).

In ESSEX it is common, but much more local than *A. euphrosyne* in the Brentwood area (Williams). It was formerly common in the Epping Forest area at the end of the last century (Fitch, *Essex Nat.*, 1891).

**Argynnis aglaia* Linn.—M.21, H. 20, E2.18, K.16, S.17.

This fine and powerful butterfly, the Dark Green Fritillary, is a frequenter in the south of downlands and open woods where it dashes about round the thistle blooms. Sometimes it is in great numbers, especially on the downs. It appears in early July and throughout August and is found all over the British Isles up to the north of Scotland, where the green of very large females is very much suffused with black. The velvet black larva feed on dog violet, hibernating while small and maturing in the spring. It is widely distributed round London, being recorded from:—

SURREY. As frequent on Banstead downs, near Epsom, and on Colley Hill (Menzies), in 1943 on Boxhill, also in Ashtead woods in 1945 (Russwurm).

In MIDDLESEX it is sometimes seen round Northwood (Martin) and common at Copse Wood, Ruislip, 1945 and 1946 (R. Smith) and at Harefield.

In KENT it was fairly common on the downs at Shoreham and Eynsford (Browning) from 1932 to 1946 and occasionally seen in Pett's Wood and Joyden's Wood (F. Swain). It was abundant in fields near Wrotham in 1947 (Owen) and one was seen on a bombed site at Lewisham in July, 1945 (Owen).

In ESSEX it is reported as occurring in one locality in the Brentwood area, but is not common (Williams).

In HERTS it was observed round Hoddesdon and Broxbourne and in Chorley Wood (Foster, *Lep. Herts.*, 1937).

**Argynnis cydippe* Linn.—M.21, H.20, E2.18, K.16, S.17.

This most active wood-loving insect, the High Brown Fritillary, occurs during July over the whole of England up to south-west Scotland, but is unknown in Ireland. It is very partial to thistle flowers, on which numbers may sometimes be seen together, especially in the evening. It is locally common in the London area, being reported from:—

SURREY. As frequently seen on Banstead downs and round Epsom and a few on Boxhill in 1943 (Stallwood). Common in Ashtead woods (Sterling) and in Princes Coverts, Oxshott (Stallwood) in 1947, in which year it was recorded from Wimbledon Common (Underhill).

MIDDLESEX. Locally common round Northwood and Copse Wood, Ruislip (R. Smith), and near Harefield.

HERTS. Occurs near Broxbourne (B. Thorn) and has been seen also round Essendon and Hoddesdon and in Chorley Wood (Foster, *Lep. Herts.*, 1937).

KENT. Fairly common in Joyden's Wood and in woods round Wrotham, Chelsfield, Shoreham Hill and in Darenth Wood in 1945 and 1946 (Owen) and first seen on Hayes Common in 1947 (Burton).

In ESSEX it is abundant in the Brentwood area (Williams) and has occurred in Hainault Forest and Ongar Park Wood.

**Argynnis paphia* Linn.—M.21, H.20, E2.18, K.16, S.17.

This fine butterfly, the Silver-washed Fritillary, is a true lover of the woods, appearing early in July and occurring all over Southern England up to the Northern Counties, also in Western Ireland and a part of North-west Scotland from which it has been recently reported. The Dark-green form of the female, f. *valesina*, seems confined to the South-east, especially the New Forest, where it represents about ten per cent. of the total numbers. The insect is very partial to bramble blossom and may often be seen in numbers disporting itself on the bushes in woodland rides. The egg is laid on the bark of trees on which the young larva hibernates immediately on hatching and then feeds up in the spring on various species of Violet. It is quite widespread in the London district.

In SURREY, at Colley Hill, it is quite frequent in the woods (Menzies) and also on Bookham Common in 1947 (Garrett Jones). Quite numerous in Oxshott woods, Ashtead (Sterling) and round Claygate (Stallwood). Two were seen and one caught in Richmond Park in 1935 (Collenette).

In MIDDLESEX it has been recorded from Northwood (Martin), round Harefield R. Smith), and in the woods west of the reservoir at Ruislip (Bentley).

In KENT it was common in Joyden's Wood in 1946 and two were seen in that year at Shooter's Hill (Owen). Very plentiful in 1947 in Joyden's Wood and Darenth Wood, also at Eynsford and Otford, Elmstead woods, Hayes Common and round Keston (Burton). One taken at Bickley, July 1950 (Browning).

In **Herts** it has been freely seen in woods round and in Chorley Wood, Hoddesdon (Foster, *Lep. Herts.*, 1937).

In **Essex** it has reappeared after many years in the Brentwood area (Williams). It apparently disappeared from Epping Forest about 1874 (Fitch, *Essex Nat.*, 1891).

Argynnis lathonia Linn.—S.17.

The Queen of Spain Fritillary, with its superb underside of mother of pearl, is always a most prized capture on our shores. It is only a very occasional migrant, though it has been recorded annually since 1943 and as many as 36 were reported in 1945 when there is evidence that it bred in this country. I am glad to be able to include it on our list, though it appears to have visited the area only once in recent years, when a female was taken by A. H. Owen of Croydon at Upper Brigg Farm, Warlingham, on September 30, 1934. Abroad it is double-brooded appearing in June, and August and September.

Melitaea athalia Rott.—M.21, (E2.18).

The Heath Fritillary is one of the most attractive yet one of the most local of our butterflies which in bygone days inhabited the outskirts of London. Wilkes, in 1745, writes of its occurrence at Tottenham, and it was reported from Ongar Park Wood as late as 1839 according to E. Fitch in *The Essex Naturalist* (1891.v.76). Now its range in this country extends through a few restricted localities in S.E. Essex, North Kent, South Sussex and there is a flourishing race in the thick woods of South Devon where its foodplant, the cow wheat, abounds. It is gratifying, however, to know that quite recently this insect ap peared in some woods just north of London and there is every reason to think that they were of natural occurrence. Perhaps it is re-establishing itself in its old haunts. It is on the wing in late June and throughout July.

Euphydryas aurinia Rott.—H.20, (E2.18), S.17.

The Marsh or Greasy Fritillary is an insect of most varied appearance and habitats, being found in colonies in woods, on chalk downs as well as in marshes as its name implies. It is very widespread over the British Isles in almost innumerable forms with specially named races from Scotland and Ireland. In the London area it has recently been discovered in **Herts** near Broxbourne where there is apparently a thriving colony. One was seen in Oxshott Woods by Dr Cockayne and Dr H. B. Williams (*Ent. Rec.*, 1931, 43) and another on Bookham Common in June 1950 (D. Baker). These seem to be the only recent records of this insect which was reported in 1839 from Ongar Park Wood and High Beach and about that period from Wanstead Flats.

It is on the wing about the middle of May and sometimes the ground is black in April with crawling masses of the larvae in places where the devil's bit scabious, its foodplant, flourishes. The insect has a curious habit of suddenly establishing itself in a new locality and area where it has never been seen before.

VANESSIDAE.

**Vanessa atalanta* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This well-known and easily recognisable butterfly, the Red Admiral, is found all over the British Isles and like other members of this genus is a great frequenter of gardens and orchards, where it is very partial to rotten fruit. There is still rather a mystery as to where and how it hibernates, as it has occasionally been found wintering in this country, but is replenished by migrants in the spring and is usually on the wing till late November. The larva feeds singly in a tent made from leaves of nettles. It is generally distributed over the London area and is often seen in the parks of Inner London and especially on the buddleia bushes in the bombed sites. It varies appreciably in its numbers from year to year.

In Inner London it has been observed in Cannon Street in Sept. 1947 (Pedler), in Cripplegate (Currie) and in St James's Park (Carter) and in other London Parks and on bombed sites notably near South Kensington Station in 1948 (C. de W.).

SURREY. Often seen on Wimbledon and Wandsworth Commons and at Mitcham (Sterling), also in Richmond Park (Collenette).

KENT. It was seen in hundreds in 1946 round Greenwich and in the Lewisham area (Owen).

**Vanessa cardui* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Painted Lady is probably the greatest migrant in the Palaearctic region and in fact has been found in almost every part of the world. At frequent intervals it invades this country in huge numbers, usually in June and produces a large brood in the late summer. The larvae are easy to find in their neat tents made among the leaves of several species of thistle. It has been found at times all over the London area and particularly in the Metropolis. It has been observed:—

In Cripplegate in August 1947 (Currie); St James's Park in Sept. 1947 (Carter); and two seen on buddleia in Cannon Street in August 1949 (S. W. Swain).

In SURREY it was very common at Hinchley Wood and Claygate in 1945 (Stallwood) and on Wimbledon Common each year from 1942 to 1946 (R. Smith).

In MIDDLESEX it was very common in 1945 round Ealing and Uxbridge (Bentley).

In KENT it was very abundant round Lewisham in 1947 where nearly 600 were observed, and fairly numerous in that area in 1946 when larvae were common on thistles (Owen).

It appears to have been seen at different periods in all parts of HERTS and ESSEX.

**Aglais urticae* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Small Tortoiseshell is another very well-known insect occurring all over the British Isles and in every part of the London area. The species hibernates and appears very early in the spring, usually producing two broods in the season in June and September. The large nests of larvae on nettles are a familar feature of the countryside. It is quite common in the London Parks and inner suburbs. Some of the more interesting recent records are from Inner London. Plentiful on dahlias in St James's Park in September 1947 (Carter) and observed in that year in Cannon Street (Pedler) and quite common on Cripplegate bombed site in July, 1947 (Currie).

SURREY. Nearly 800 seen during 1947 near Oxshott (Stallwood) and very plentiful at Hinchley Wood, 1944 to 1946.

KENT. Abundant at Lewisham in August 1947, when 720 were counted (Owen).

**Nymphalis polychloros* Linn.—I.L., M.21, H.20, K.16, E2.18, S.17.

The Large Tortoiseshell can be counted as one of the more select residents of the London district and formerly quite a frequent visitor to the Inner Metropolis, as it seems to have a predilection for large towns. In the 1898 list it was reported from Smithfield Market and was seen on the Victoria Embankment. For some unknown reason, possibly due to the incursion of parasites to its larvae, it became extremely scarce soon after 1920 and it was quite an event to see a Large Tortoiseshell in the Southern Counties. It was not till 1948 that it seemed to make a come-back. It was very numerous in some parts of the south that spring and summer, but less common in 1949. It has been recorded from most parts of the British Isles, but has always had its main stronghold in the Eastern Counties. It usually appears after hibernation in early March and is very partial to sallow bloom. It produces a brood in late July, but these summer butterflies have the curious habit of going into hibernation after about a fortnight on the wing, in mid-August. The larvae feed in large companies, mainly on elm and sallow. Recent records from the London area include:—

SURREY. One seen in 1942 at Chipstead (Menzies). One seen at Claygate on 13th April 1947 (Stallwood). One seen at Esher in April 1949 by D. S. Palmer.

MIDDLESEX. One taken at High Barnet, August 1947. One seen by Prof. Warmington at Stanmore on 21st April 1948.

HERTS. One taken at Broxbourne on 11th July 1944 (Miss Thorn).

ESSEX. It has been occasionally seen in the Brentwood area (Williams).

KENT. One taken at Hayes Common on 24th May 1947 (Owen). A pair seen on a bombed site at Lewisham in July 1944 and one caught in this spot on 29th March 1946 and another on 27th July 1947 (Owen, *Entom.*, 82 (1949), 88). In 1948 it was seen at Lewisham on 11th April (Owen), on Hayes Common on 2nd April (S. Johnson), in Farningham Woods on 11th April (Showler) and on 30th July in Grove Park (Hyatt).

**Nymphalis antiopa* Linn.—I.L., M.21, H.20, E2.18, K.16, S.17.

From its name the Camberwell Beauty rightly takes a place of honour among London butterflies. During the past century it has visited the Metropolis on many occasions. Doubleday records one taken in Epping Forest in 1846. The 1898 list gives fifteen records from Tottenham, Dulwich, Balham, Croydon, Greenwich, Leytonstone, Tooting Common, Wimbledon, Ealing and from Richmond Park in 1889. The majority of our visitors probably come from Scandinavia, which appears to have been the source of the largest invasion in 1872, when 436 were recorded. Few years pass without reports of *antiopa* and since the beginning of the Century there have been at least 26 authentic reports of its occurrence within the London area, though that of four specimens in 1930 is of doubtful authenticity since in that year a well-known firm admitted releasing a number for publicity purposes. Since the start of the century I have been able to glean the following records for the Area, which are appended in chronological order.

One taken in 1900 in the streets of St Albans (*Herts. Nat. Hist. Soc.*, xiv: 237). One at Hatfield in October 1900 (Foster, *Lep. Herts.*, 1937).

A specimen taken in Raynes Park by W. Smith on 29th August 1904 (*Entom.*, 1905, 91).

One taken at Harrow reported by Vassall on 27th July 1905 (*Entom.*, 1905, 283).

One seen at Broxbourne and another at Enfield in the Royal Arms Factory in 1909 (*Entom.*, 1909, 42: 282).

One seen at Weybridge on 5th March 1910 (E. Parker, *Entom*, 1910, 43: 119).

One taken at Chelsfield, Kent, in August 1910 (Harold Smith, *Entom.*, 1912, 45: 209).

One taken at Addiscombe on 22nd September 1915 (C. Saville, *Entom.*, 1915, 48: 267).

A capture of a specimen at Oxshott, Surrey, on 2nd August 1917 (W. Dallas, *Entom.*, 1917, 50: 235).

One taken at Reigate on 25th September 1924 by H. Speyer (*Entom.*, 1924, 57: 282).

One seen at Beckenham in 1930 (Frohawk, *Entom.*, 1930, 63: 14).

One seen in Dulwich Park on 2nd September 1928 (Frohawk, *Entom.*, 1928, 61: 236).

One seen near North Weald on 7th August 1931 by G. Sutton (*Entom.*, 1931, 64: 258).

A female taken by A. W. Buckstone at Ashtead on 25th May 1935 (*Entom.*, 1935, 68: 15).

One seen at Harrow on 24th September 1938 (Thornton).

A specimen flew into a garage at Hendon on 23rd April 1940 (Richardson, *Entom.*, 1940, 73: 161).

One seen at Edgware by Mrs Cooper on 16th July 1943 (*Entom.*, 1943, 76: 170).

1945 was an outstanding year for migrants. In this season there are three records of *antiopa* for the Area. One taken near Beaconsfield on 26th August by Mrs Bratchart.

Wings of a specimen eaten by a bird found by Major Henderson at Buckhurst Hill on 28th July. Another seen at Beaconsfield in July by L. Hugh Newman.

In 1946 there are apparently two records, one found in a moribund condition at Biggin Hill in May (*Entom.*, 1947, 80: 148) and another taken in Ashtead woods that spring by A. Russwurm. Possibly the most surprising capture was that of Mr Leutscher, who was astonished to find a female in fairly good condition fluttering at a window in the Natural History Museum, South Kensington, on 22nd August 1947 (*Entom.*, 1947, 80: 220). I have little doubt that this was a genuine migrant, which found its way into the Museum buildings and is now in the National collection.

Another remarkable capture was a pair *in cop.* at Bexley, Kent, by Mr M. Wright on 11th April 1948. This is of special interest as I know of no other instance in modern times of a natural pairing of this species in this country. 1948 was a particularly good year for this species. On 15th February Mr R. D. Hilliard found a specimen hibernating under some logs in his garden at Stanmore (*Entom.*, 1948, 81: 95). Another was seen in Ongar Park Wood, Essex, by Dr I. H. Jenkins on 10th April (*Entom.*, 1948, 81: 163).

**Nymphalis io* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This striking and familiar butterfly, the Peacock, is widespread all over the British Isles and has latterly become much commoner in Scotland. It has been seen all over the London area, mainly in gardens, and is a frequent visitor to the London Parks and bombed sites, where it disports itself on buddleia bushes in August, which is its time of appearance. It goes into hibernation in the late summer, reappearing the first warm days of spring. Its large nests of black velvety larvae are a familiar sight on beds of nettles in gardens and along the hedgerows. Some of the more interesting records in the London area include the following:—

Surrey. In Kew Gardens it was seen in some numbers in 1924 (Keywood). Frequent in most years on Wimbledon and Wandsworth Commons (Sterling) and in Richmond Park (Collenette). Common at Ashtead every year (Sterling), 275 imagines seen in 1947 in the Oxshott district (Stallwood).

In Inner London it is often common in the Parks and numerous on buddleia on bombed sites, notably near South Kensington Station (C. de W.).

In Middlesex it was seen in small numbers in gardens round Ealing, 1945-1946 (R. Smith).

In Kent it was very common in 1946 round Lewisham, Blackheath and in Greenwich Park (Owen). In August 1947, 70 were counted on privet flowers in Joyden's Wood (Owen).

**Polygonia c-album* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Comma is a butterfly of especial interest owing to its steady spread eastwards during the past thirty years. In the early part of this century it seemed confined to the western counties mainly round Gloucester and in Somerset and Devon. Soon after 1920 it gradually extended its range to the east and is now firmly established all over Southern England and right up to the northern Counties. The hibernated butterflies reappear in the early spring and produce a summer generation in July and an autumn one in October with very dark undersides. The larva, which feeds on elm, hop and nettle, etc., is very characteristic with a broad white patch near its anal end. The Comma has been recently recorded from all over the London area. In the 1898 list it is only recorded from Clapton.

Surrey. Many seen round Esher and Boxhill in 1945-46 and 25 in the autumn of 1943 on Littleworth Common (Stallwood) and seen regularly round Claygate, 1934 to '46 (Keywood), also on Oxshott and Ashtead woods, 1936-39 (Sterling). Occasionally seen in Richmond Park (Collenette). In September 1934 one was seen at Kingston Hill and another at Ham (Collenette). It was observed on Bookham Common in 1945 (Longfield), 1947 (Garrett Jones) and 1948-9 (Currie).

In Inner London one was seen flying in Lower Regent Street in 1940 (S. W. Swain, *Entom.*, 1949, 82 : 112).

Middlesex. One seen at Twickenham in September 1946 (Stallwood), also several observed round Northwood and Greenford in 1945 (Martin). One taken in August of that year at Northholt (K. Braid). Common in Northwood Copse, 1943-46 (P. Bain). Occurred in Acton and Ealing, 1942-46 (R. Smith).

Kent. Widely distributed in the Lewisham district, 1946 and 1947, especially in the autumn, also seen at Blackheath, Hayes Common and Shooter's Hill and very plentiful in Joyden's and Darenth woods in 1946 (Owen).

Herts. Common at Broxbourne in 1934 (B. A. Thom) and in that year at Rickmansworth. Also at Chorley Wood (Foster, *Lep. Herts.*, 1937).

Essex. Widely distributed in the Brentwood and Epping Forest districts (Williams).

**Apatura iris* Linn.—(H.20), (E2.18), S.17.

The Purple Emperor has truly earned its name and can be regarded indeed as the monarch of our butterflies. It always affects only woods where there is plenty of oak, ash and sallow. It is more widespread than is generally imagined in suitable localities throughout southern England from West Kent to Devon and Monmouth and northwards to Lincolnshire. The chief danger to its existence is the cutting of oaks and replacement by conifers. The males like to fly round the oak tops most of the day, but come down early in the morning, especially in hot weather, to imbibe moisture from manure heaps, muddy pools and carrion. Mid-July is its usual time of appearance, and the well-known green slug-like larva with horns can often be found on the upperside of leaves of low sallow bushes in April and May after emerging from hibernation.

This fine insect was formerly seen frequently in Epping Forest when Doubleday lived in that neighbourhood more than a hundred years back and in the 1898 list it is reported from Woodford. In 1909 a young collector saw a female settled on the ground near Enfield (G. Talbot, *Entom.*, 1909, 282).

One was seen in Prince's Covert, Oxshott, in August 1943 (Menzies) and three seen and two captured in Ashtead Woods in 1945 (Russwurm) and a female seen on Bookham Common during a meeting of the Society on 11th August 1947.

Earlier records of the Purple Emperor in the Area include several seen in Oxhey Woods in 1878 (Foster, *Lep. Herts.*) and two observed near Brentwood in 1882.

Limenitis camilla.—M.21, H.20, E2.18, K.16, S.17.

This graceful butterfly, the White Admiral, an inhabitant of shady glades in woods, has also extended its range remarkably during the past twenty years. It now appears quite commonly in most wooded districts in Southern England and in many parts of the London area. It is usually on the wing by the end of June. The female deposits her eggs on the leaves of honeysuckle, preferring rather straggly growth in the shade of oak trees. The small brown larvae spend the winter in a tent, and turn green in late April, feeding up rapidly until the end of May, when they pupate. In the London district it has been recorded from:—

SURREY. As common in woods round Epsom and Ashtead, 1943-46 (Menzies). Several seen at Esher and Arbrook Common in July 1945 (Stallwood) and Surbiton Golf Course and Arbrook Common, 1946 (*Id.*) and in 1947 on Surbiton Golf Course and in Oxshott Woods (*Id.*). First seen on Wimbledon Common in 1924 (Hawkins). Several noted on Bookham Common in 1943 (Keywood), and 1946-1949 (Currie).

MIDDLESEX. Observed round Northwood in 1945 (Martin) and in 1946 at Copse Wood, Ruislip (K. Braid), where it was abundant in that year (P. Bain); also very plentiful at Harefield (R. Smith).

KENT. It has occasionally been seen at Chislehurst in 1946 (Browning). Fairly common in Joyden's Wood and on Hayes Common, where there was a marked increase in numbers in 1946 (Owen). Plentiful in Darenth Wood and round Eynsford and Shoreham. One seen in September 1947 of second brood in Joyden's Wood (Owen). First noted at Pett's Wood in 1947 (F. Swain).

HERTS. First seen near Broxbourne in 1934 (B. Thorn), and also taken near Essendon (Foster, *Lep. Herts.*, 1937), also round Hatfield and Bricketwood in 1936 (*Ibid.*).

ESSEX. It has reappeared recently in the Brentwood area (Williams), and has been seen in Epping Forest (Fitter).

LYCAENIDAE

The next family, scientifically known as the *Lycaenidae*, comprises the Blues, Coppers, and the Hairstreaks, of which 13 species have been recorded from the London area during this century. The only two not on the list are the Black Hairstreak, *Thecla pruni*, and *Everes argiades*, the Short-tailed Blue. The characteristic of this family is the specialised woodlouse-like form of the larva.

**Cupido minimus* Fuessl.—H.20, (E2.18), K.16, S.17.

The Small Blue, as its name implies, is the smallest of our butterflies, and always very local on chalk terrains, where its foodplant, the Kidney vetch, grows. It is very local in the Area, being recorded from: —

SURREY. Where it occurs on the Epsom Downs (Menzies) and was abundant in 1946 (B. Thomas) and also observed on the downs at Chipstead and Mickleham (Vallins) and Banstead Downs in 1941 (D. B. Baker). In the 1898 list it is recorded from Croydon.

In KENT it is regularly seen near Shoreham and Eynsford, where it appeared in hundreds in 1948.

The insect normally appears at the end of May and often again in August. It has been found locally all over England up to the North-east coast of Scotland and commonly in many parts of Ireland.

Maculinea arion Linn.—(H.20).

This very local insect, the Large Blue, in recent times only appears to inhabit our south-western regions, Devon, Somerset, Cornwall and the Cotswolds. Formerly it was taken regularly in the south Midland counties, which may account for the record of a specimen near Haileybury in 1886 and three seen in that neighbourhood in 1898 (Foster, *Lep. Herts.*, 1937). The association of its larva with ants' nests give this insect the most remarkable life history of any of our butterflies.

Plebeius argus Linn.—(M.21), E.2.18, K.16, S.17.

This delightful little insect, the Silver-studded Blue, must be well known to those who visit the Surrey heathlands round Oxshott during July, as it flits about over the heather. It produces more forms than any other species of this family, since it has very distinct races occuring on heath, chalk and limestone. Two races from the former two types of terrain are found in the London area. It is very common on most heath lands in the southern counties, especially in the New Forest, but in our area has only been reported from Kent, Surrey and Essex, also formerly from Middlesex.

In SURREY the smaller heath race, in which the males are with deep purple-blue colouring and greenish underside, occurs freely on the large tract of heathland round Oxshott, where a strong colony flourishes and was numerous in 1948 (C. de W.). It is also locally plentiful on Wisley Common (Stallwood). One was seen on Surbiton golf course in 1943.

In MIDDLESEX it was formerly recorded from Scratch Wood, Edgware, Harrow, and Ruislip (Tutt, *British Lepidoptera*, x, 244).

In KENT is found the larger race on the chalk, f. *cretacea*. In this the males are paler blue than the heath form and have very silvery undersides. This form is common on the downs at Eynsford, Otford, Magpie Bottom and round Wrotham. It was generally common in this area in 1947 (Owen).

ESSEX. There is a flourishing colony in the Brentwood district (Williams). It was formerly common in Epping Forest in the time of Doubleday.

The butterfly is on the wing throughout July and is found only in England and Wales up to the Lake District. Very doubtfully reported from Scotland.

**Aricia agestis* Schiff. (*astrarche* Fabr.) Bergst.).—M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Brown Argus is a very widespread butterfly throughout the country and the London Area, being found in nearly every type of terrain.

It has been noted commonly from SURREY at Banstead, Epsom, and Boxhill in 1946 (Stallwood) and at Caterham (B. Thomas). Both broods numerous on Surbiton Golf Course in 1944.

In MIDDLESEX it has been reported from Northwood and Chorley Wood.

In KENT it was common in 1946 near West Wickham and at Sundridge Park and in Joyden's Wood, Shoreham, Eynsford and in Darenth Wood (Owen).

In HERTS it has been noted commonly round Hoddesdon and Broxbourne (Foster, *Lep. Herts.*).

In ESSEX it sometimes abounds in the Epping Forest area.

It is double-brooded, appearing in May and August, and occurs in most parts of the British Isles. In Scotland it is replaced by the local race, f. *Artaxerxes*, having a white discal spot on the forewing.

**Polyommatus icarus* Rott.—M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Common Blue, as its name applies, is the most numerous and widespread of this group of the *Lycaenidae*. It is to be found all over the British Isles, often producing three generations in a year, though only one as a rule in Scotland and Ireland. It has been seen all over the London area, often in great profusion, especially in 1949, which was a remarkable year of plenty for this insect.

In SURREY it is a regular inhabitant of the area bordering the southern part of the Metropolis, notably on Wimbledon Common, Mitcham Common, New Malden (Sterling) and was often seen on Sheen Common from 1929 to 1934 (Menzies) and in Richmond Park (Collenette).

In MIDDLESEX it is common at Ealing (R. Smith).

It is widely distributed all over ESSEX and HERTS.

KENT. Very common in 1947 round Lewisham, Greenwich and Blackheath (Owen) and generally distributed in the Pett's Wood district (Swain).

**Lysandra corydon* Pod.—H.20, (E.2.18), K.16, S.17.

The Chalk-hill Blue is by far the most variable of the *Lycaenidae*, over a hundred forms having been described for both sexes. It is an insect essentially of chalk downs and is found in very large colonies on the outskirts of the London area. In the 1898 list it was reported from Barnes, Hounslow, Beckenham and Croydon. Its present range seems to be mainly in Kent and Surrey.

In SURREY it is common in colonies at Boxhill and Mickleham (Vallins), on Epsom and Banstead Downs (Menzies), formerly at Riddlesdown and Sanderstead, but both habitats are now built over (Keywood), though a few were found near the former locality in 1944 (Russwurm). One was seen on Bookham Common on 10th August 1947 (Garrett Jones).

In KENT it was very abundant at Shoreham in 1948 and near Eynsford and Biggin Hill in 1947 (Owen) and it was seen in the Pett's Wood area in 1935 (F. Swain).

In HERTS there is a flourishing colony near Broxbourne (Foster, *Lep. Herts.*, 1937).

In ESSEX it was common in Epping Forest in 1859, but seems to have long since disappeared (Fitch, *Essex Nat.*, 1891).

The insect is on the wing throughout August and is found over most of the Southern counties up to Lincolnshire and was formerly taken in South Lancashire.

**Lysandra bellargus* Rott.—K.16, S.17,

The Clifden or Adonis Blue has very similar habits and habitats to the Chalk-hill, except that it is double brooded appearing in May and August and only extends its range up to the Southern Midland counties. It affects open chalk downs and apparently has only been noted in two counties in the London Area, Kent and Surrey.

In SURREY it is common on Boxhill and on the downs round Epsom where it was observed in fair numbers from 1943 to 1946 (Menzies). In the 1898 list it was reported from Croydon. There was formerly a colony near Oxted (Fitter).

In KENT it was quite common in 1948 on the downs round Shoreham (Owen) and at Magpie Bottom (Burton).

**Lampides boeticus* Linn.—K.16, S.17.

This rare migrant species, the Long-tailed Blue, an inhabitant of almost every part of the Old World except the far north, has visited the London area on a few occasions. It is indeed curious it should be such an uncommon visitor, as it is quite a regular one to the Channel Islands. Its larva is very destructive to many plants of the Leguminosae, chiefly peas.

There is an old record of a specimen being taken in his house at Woolwich by Mr Cecil Brooks on September 29th, 1898.

Of more recent records, in that great migrant year, 1945, when 31 Long-tailed Blues were reported, one was taken at Greenford by Mr Parr, and four were seen at Epsom by Mr A. W. Buckstone on 27th August. The most recent record is of one taken by Mr Michael Ayres at Streatham on September 7, 1949.

**Celastrina argiolus* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Holly Blue is one of the best known butterflies of Inner London and its immediate surroundings, often appearing as early as late March when the females flit round the hollies on which it deposits its eggs which produce the later brood in August. This generation, however, feeds upon the buds of ivy. It is a butterfly of great abundance in some years and extreme scarcity in others. It is found all over England up to Lancashire and Southern Scotland. In the London area it is reported from SURREY as common in most years on Wimbledon Common (Sterling) and frequently seen in Richmond Park (Collenette). Very common in 1946 round Hinchley Wood and Sheen.

In INNER LONDON it has been observed in the centre of the City at Cripplegate in July 1947 (Currie) and in Campden Hill Square in 1923 by Holte Macpherson.

From MIDDLESEX it is reported as common round Ealing in 1946 (R. Smith) and near Staines (Longfield), also at Harrow and Northwood in 1945.

In BUCKS it is recorded from Colnbrook (Longfield).

In KENT it is generally distributed round the Lewisham district, Blackheath, Eltham and Greenwich (Owen) and in the Pett's Wood area (F. Swain).

In ESSEX it is reported from Purfleet (Bowden).

From HERTS at Broxbourne (B. Thorn).

**Lycaena phloeas* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Small Copper is one of our best known butterflies, occurring all over the London Area into the centre of the Metropolis as well as in every part of the British Isles, except the most northerly points. It produces at least two broods a year in May and August and in very hot summers a third and often very variable generation in September. In some years, however, it is sometimes exceedingly scarce. Its more interesting recent records in the Area include:

SURREY. Very plentiful in 1944 and 1945 round Hinchley Wood, but scarce there in 1946 (Stallwood). Common at Sheen from 1929 to 1933

(D. King), also on Wimbledon Common and New Malden (Sterling) and often observed in Richmond Park (Collenette). It has been seen in Lonsdale Road, Hammersmith (R. Smith).

In INNER LONDON it was observed flying round dahlias in St James's Park in 1947 (J. Carter), in Cannon Street in the City in September 1946 (Pedler), and at that date in Cripplegate (Currie), a colony was observed in bombed areas near Aldersgate Street in October 1947 (Easterling, *Entom.*, 82, 1949, 116), also reported from MIDDLESEX as frequent at Strawberry Hill, Ealing and Acton (R. Smith) and round Ruislip (Martin).

In KENT it was especially common in 1945 round Lewisham and Chislehurst (Owen) and Shoreham, Orpington (Browning) and in the Pett's Wood area (F. Swain), also at Blackheath, Kidbrooke and in Joyden's Wood (Owen).

It is generally distributed and often common all over ESSEX and HERTS.

**Callophrys rubi* Linn.—M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Green Hairstreak is by far the commonest and most widespread of the four species of Hairstreaks found in the London area, where it occurs in all parts right up to the suburban district. In the 1898 list it is reported as very scarce.

In SURREY it is recorded as frequent and often common on the downs at Banstead, Epsom and Boxhill from 1943 to 1946. From Richmond Park in 1947 (Collenette) and Ham Common in 1943 (Russwurm). It was first seen on Surbiton Golf Course in May 1947 (Stallwood).

In MIDDLESEX it has been reported from Hangar Hill and Ealing (R. Smith), and as common round Northolt in 1945 and 1946 (Braid).

In KENT it was abundant in Joyden's Wood in 1946 and 1947, and also at Shoreham and Eynsford and Biggin Hill in these years, but very local in the Lewisham area (Owen). It has been seen in Greenwich Park (Burton) and occasionally in Pett's Wood (F. Swain).

It has been reported from Purfleet in ESSEX (Bowden) and from Broxbourne, HERTS (B. Thorn).

The insect appears in May and is found throughout the British Isles, and is often very common on the moors in Scotland.

Thecla betulae Linn.—(E2.18), K.16.

The Brown Hairstreak is exceedingly local in southern England, usually inhabiting thickly wooded areas where there are plenty of stunted sloe bushes on which its green louse-like larva feeds. It is on the wing in August when the males like to disport themselves round the tops of tall ash trees. The only recent record from the London Area is from KENT, where several were seen on sloe hedges in the Farnborough district in 1946 (Owen).

From ESSEX it was formerly recorded during the latter end of the last century from Epping Forest.

**Thecla quercus* Linn.—M.21, H.20, E2.18, E.19, S.17, K.16.

The Purple Hairstreak is essentially a frequenter of oak woods, in which it can often be seen in swarms round the oak tops in July. It is widespread in England and Wales up to the Northern Counties and very well represented in the London Area.

In SURREY it was common in 1946 at Hinchley Wood, Surbiton and Claygate (Stallwood) and at Oxshott and Ashtead (Sterling). A large number were seen on Bookham Common in August 1947.

In MIDDLESEX it has been seen at Northwood (Martin), and at Ruislip (Saunders).

In ESSEX it is abundant in the Brentwood area (Williams).

In HERTS reported from Broxbourne (B. Thorn), Hoddesdon and Oxhey Woods (Foster, *Lep. Herts.*, 1937).

In KENT it is very local in the Lewisham area, but fairly plentiful in 1946 and 1947 in Elmstead and Joyden's Woods (Owen). Abundant in Oak woods all over the North Downs round Otford, Chelsfield and in Darenth Wood (Owen), also in Pett's Wood (F. Swain) and at West Wickham (Browning).

Strymonidia w-album Knoch.—H.20, E2.18, K.16, S.17.

The White-letter Hairstreak is a very local insect frequenting clearings mainly in woods in the vicinity of wych elms on which its larva feeds. It appears in early July and is very partial to bramble bloom. In the London Area it has been recorded from SURREY at Boxhill (Menzies).

In ESSEX it is reported as common in the Brentwood area (Williams).

In HERTS it has been seen at Watford (Saunders) and has been reported from Broxbourne (B. Thorn).

In KENT the larvae are reported as common at Shoreham (Sterling), and it was in fair numbers at Eynsford in 1947 (Owen) and common in Darenth Wood and Holwood Park, Keston, in 1948 (Burton).

Its range is over the southern half of England.

Danaus plexippus Linn.—M.21.

This remarkable insect of exotic appearance, known usually as the Monarch or Milkweed, has only honoured the London Area once, it appears, since the start of the century. This was on October 2, 1937, when one was distinctly seen flying along a street in Harrow by Kenneth Clarke and reported by E. W. Classey (*Entom.*, 1937, 246). Only four were recorded for that year as against 38 in 1933, the highest for a single season. Its main habitat is North America, where it undertakes migration in huge numbers. It has also colonised the Canary Islands, which may be the source of our wanderers.

Papilio machaon Linn.—M.21, K.16.

The Swallow Tail is undoubtedly the most spectacular of our butterflies and is the only indigenous representative of this huge family. At present the British race f. *britannicus* is confined to the Fens of Cambridgeshire and the Norfolk Broads but in recent years, and particularly from 1933 onwards, there has been an increasing number appearing in the southern counties of the larger and brighter Continental race f. *gorganus*. There is evidence that examples of this race have been seen in the area, and taken twice in recent years, in 1945 when one was observed near Orpington and in 1949 when another was caught at Hayes, Middlesex, on May 31 and reported by Miss E. N. Kelly (*Entom.*, 82, 1949: 184).

The British race was supposed to have occurred in olden days in the Hackney Marshes, and Stephens, writing about 1830, says that the Swallowtail was often taken near Epping Forest and had been taken at Stepney, while Edward Newman reports larvae at Tottenham in the 1820's.

PIERIDAE.

The family of the *Pieridae*, comprising the Whites, the Orange Tip, the Clouded Yellows and the Brimstone, are represented in the London Area by all the species at present indigenous on the British List, including the rare migrant, the Bath White.

**Pieris brassicae* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Large White is doubtless the best known of our butterflies owing to the destructive habits of its larvae. It is the only species to be classed as an official pest. It is found in every region of the London Area as well as of the British Isles, and is sometimes supplemented by huge migrations from the Continent. Some of the more interesting recent records from the Area are from SURREY, 4000 observed in 1947 within an 8-mile radius of Oxshott (Stallwood) and a plague of larvae in the Claygate area in 1945 (Keywood).

INNER LONDON. Very common in central London round Cripplegate in 1947 (Currie).

KENT. Very abundant in the Lewisham district in 1947 (Owen).

Pieris rapae Linn.—*I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Small White is almost as common in the London Area as its larger relative, though less destructive to the *brassica* tribe since its larva feeds singly. It occurs all over the British Isles producing at least two generations in a season.

In SURREY nearly 6000 were observed during 1947 round Oxshott (Stallwood), while it was very abundant at Putney in 1946 (D. King), also in most years on Wimbledon and Wandsworth Commons (Sterling).

INNER LONDON. Very common in 1947 at Cripplegate (Currie), also seen on the Victoria Embankment (P. Michael) and in St James's Park (Carter).

In Kent it was reported as being in great numbers in the Lewisham district in 1946 and 1947 (Owen) and in the Pett's Wood area (Browning).

**Pieris napi* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

Though generally widespread over the British Isles, the Green-veined White is not usually seen in such abundance as the last two species, though occasionally it is seen in great numbers in a small area. It produces a spring and summer brood. Some of the more important records in the area are from

Surrey. As abundant at Putney, 1943-46 (D. King) and at Wimbledon and Wandsworth (Sterling). Over 3000 seen in 1947 in the Oxshott district (Stallwood).

Inner London. One or two seen round Cripplegate in July and August 1947 (Currie).

Middlesex. Generally distributed round Harrow, Northwood and Oxhey Wood (Martin).

In Kent thousands were seen in Charlton sandpit in April 1946 (Owen) and it was common at Lewisham in that year as well as in the Chislehurst and Swanley areas (Browning).

Leptidea sinapis Linn.—(H.20), (E.2.18), S.17.

This pretty little insect, the Wood White, a lover of shady woods and lanes, has at present only a very slender claim to be included in London's butterflies. There seems to be definite evidence that one was seen in Ashtead Woods recently.

This species in late years has been steadily extending its range, especially in Surrey, and there is no reason why it should not become well established in the London Area if proper safeguards are taken to protect it. It has two broods a year in May and August and is locally abundant in Southern England in Surrey, Sussex and the Western counties from Somerset to Cornwall, and very widely distributed throughout Southern Ireland, where the race has a yellow instead of a green underside. It was formerly plentiful near Epping in 1839 and up to the 1850's and was taken in Ongar Park Woods up till 1888 (Fitch, *Essex Nat.*, 1891). There is also an old record of a specimen taken near Hayleybury by Mr H. M. Edelsten (Foster, *Lep. Herts.*, 1937).

**Euchloe cardamines* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This most attractive of the spring butterflies, the Orange-tip, is a very conspicuous feature of the countryside in April and May and has been seen in all parts of the London district. It was especially common in Surrey round Hinchley Wood in 1944 and 1946, though scarcer in 1946 (Stallwood). Occasionally seen in Richmond Park (Collenette). Generally distributed round Epsom, Cheam and Boxhill (Menzies) and seen annually round Claygate and on Arbrook Common (Keywood) and also on Wimbledon and Wandsworth Commons and at New Malden (Sterling).

In MIDDLESEX it has been observed in numbers in 1946 at Acton and Ealing (R. Smith) and in gardens in South Harrow (K. Braid).

In HERTS it has been noted from Broxbourne (B. Thorn) and in all parts of this county and all over ESSEX.

In KENT it was very common in many localities in the Lewisham area in 1946, and in 1947 on Hayes Common, Sundridge Park, Shooter's Hill, Keston, Greenwich Park, Elmstead and Joyden's Woods (Owen) and frequently seen in Pett's Wood, 1935-47 (F. Swain).

In the 1898 list it is reported from Tottenham, Lee Valley, Hackney Marshes, Chingford and in the central Metropolis from Muswell Hill. Finchley, Highgate and Hampstead.

The species is found all over England and Wales up to southern Scotland and all over Ireland.

(*Aporia crataegi* Linn.)—(E2.18).

The Black-veined White was formerly abundant in many areas of Southern England where its gregarious larvae were destructive to orchards. Its last stronghold was in East Kent, where it died out in the early 1920's. About a century ago it seems to have often been seen in the London Area. Stephens reports it from Epping Forest in the 1850's. There seems to be no recent record from the London Area.

Pontia daplidice Linn.—M.21, H.20, K.16, S.17.

The Bath White is usually regarded as one of our rarest and most prized migrant butterflies. There had been only some sixty records in all up to the famous year 1945, when some 650 were recorded between July and October all over Southern England up to the Midlands. In that year there were 5 records for the London Area.

On Epsom Downs a female was taken by P. M. Martin on July 15. On July 17 another female was taken by R. Maxwell in that area. Two others were caught near Tattenham Corner on July 20 and 23, reported by Dr O. Lloyd, and a further female was taken near Hounslow by Mrs Tomkins on August 8.

In 1946 one was seen near Feltham by E. W. Classey on April 21, a very early date.

There is an old record from Addington in 1894 (F. Browning) and in 1918 a male was taken at Watford on May 27 by L. Dudley.

**Gonepteryx rhamni* Linn.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Brimstone is a familiar sight in all parts of the London Area in the early months of the year and less commonly in the late summer.

It is a frequent visitor to the Central part of the Metropolis. The 1898 list mentions Isleworth, Southall, Finchley, Hammersmith and Hackney. In other parts of the area recent records include those from

SURREY. Common at Wimbledon and Wandsworth, 1936-39 (Sterling). Plentiful at Wisley, Esher and Ashtead in 1945 and frequent in Richmond Park (Collenette).

MIDDLESEX. Larvae common on buckthorn at Northwood (P. Bain) and the insect numerous round Harrow (Martin).

HERTS. Often observed at Cheshunt (Speyer) and at Broxbourne (B. Thorn).

KENT. Widely distributed round Lewisham and common in 1946 on Hayes Common, Elmstead, Blackheath, Greenwich Park, Sidcup and Bromley.

ESSEX. Generally distributed.

**Colias croceus* Fourcr.—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This spectacular migrant, the Clouded Yellow, is a frequent visitor to this country and few years pass without a single record. Occasionally it invades these shores in huge numbers and in favourable conditions, particularly in hot summers, breeds here freely. This was especially so in 1947 when the greatest number of Clouded Yellows of the century was observed between May and November. In that year they were seen all over the London Area and many of the pale form of the female f. *helice* and f. *pallida* were noted and caught. Recent records include

In SURREY. Several seen at Claygate in 1943 (Stallwood). Very common in 1947 round Oxshott and Surbiton, when 75 were observed at the end of July (Stallwood). In that year several were noted in Richmond Park (Collenette). In 1946 three were seen at Caterham (B. Thomas), one on Wimbledon Common (J. Riley), and one at Croydon (H. Airy Shaw).

INNER LONDON. One seen at Cripplegate in August 1947 (Currie). One seen on dahlias in St James's Park in September 1947 (Carter) and another visiting epilobium in Fetter Lane in October of that year (Pedler).

In 1944 in MIDDLESEX it was reported as common at Harrow (Martin). A few seen at Ealing in 1946 (R. Smith).

KENT. A few observed in September 1946 at Hayes and Elmstead, Charlton and Blackheath. In 1947, 740 were counted within a seven mile radius of Chislehurst, including 50 f. *helice* (Owen). It was frequent round Lewisham in 1945. It was scarce in 1946 in the Greenwich area, but very abundant there in 1947 (Burton) and equally so in the Pett's Wood district in that year (F. Swain).

**Colias hyale* Linn.—M.21, K.16, S.17, E2.18, H.20.

The Pale Clouded Yellow is generally less common and of more sporadic appearance than the Clouded Yellow, and it has seldom been seen further north than the Midlands. In this century its year of greatest abaundance was in 1900, when it swarmed in the Southern Counties. The South-eastern area on the coasts of Kent and Essex is its main stronghold. Here it was common in 1933 and 1934 and again in 1945 and 1947. In most of these seasons of plenty it has visited the London Area. The recent records include:—

SURREY. Three seen at Boxhill on 10th July 1946, and one female on 11th July of that year at Surbiton Golf Course (Stallwood). In 1945 one was seen at Epsom on August 27 (Buckstone).

There are a few records from the Brentwood area of ESSEX (Williams).

In MIDDLESEX one was seen at Harrow on October 4, 1945 (Chester).

In HERTS it has been noted at Watford.

In KENT, during 1947, 53 specimens were recorded round Eynsford and Shoreham and one in Joyden's Wood (Owen). In 1948 one was taken at Lewisham on August 27 (Owen), another seen in the Dartford marshes in September of that year. A male was taken on May 30, 1948, at Eynsford (Lousbury).

In 1948 the well-known Belgian entomologist, M. Lucien Berger, described another species of Colias which had hitherto been confused with *C. hyale* and which has proved to have been a frequent visitor to Great Britain. It has come to be known as *Colias calida*, and has probably been overlooked in the London Area. It affects rough hillsides and downlands, rather than clover and lucerne fields like *C. hyale*. In general appearance both sexes are by no means easy to distinguish from *C. hyale*.

RIODINIDAE.

Hamearis lucina Linn.—H.20, (E2.18), K.16, S.17.

The Duke of Burgundy Fritillary is our only member of the large exotic Family of the Riodinidae. It is very local in the Southern Counties, appearing in early May and frequenting clearings in woods and downlands where its foodplant, the cowslip, flourishes.

It has been recorded in recent years on the southern and eastern fringes of the London Area at Mickleham Downs (Vallins) and also near Eynsford (Burton), but it is certain to occur in many other localities on the Surrey and Kent downs, where it is hoped that more colonies will come to light. It was formerly found in Darenth Wood and near Dulwich in the time of J. Stephens about 1830).

A flourishing colony was discovered in Chorley Wood, Herts, in 1924 (Foster, *Lep. Herts.*, 1937), and it was common in Epping Forest about the middle of the last century (Fitch, *Essex Nat.*, 1891).

HESPERIDAE.

The large Family of the Hesperidae (the Skippers) is represented in England by eight species, of which six are found in the London Area. They are characterised by the special clubbed shaped antennae, and the peculiar larvae, which have the head separated from the body by a distinct neck.

**Erynnis tages* Linn.—M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Dingy Skipper is very widespread throughout the British Isles, extending in range to mid-Scotland, and appearing in May and again occasionally in August. It is quite common in the London Area, having been reported from

SURREY. As plentiful in 1944 at Boxhill and at Esher in 1945 (Stallwood), also on Wimbledon and Mitcham Common (Sterling) and very numerous at Caterham in 1946 (B. Thomas).

MIDDLESEX. Common at Northwood (Martin) in 1945 and two taken in that year at Northolt Junction (K. Braid).

In HERTS seen at Broxbourne (B. Thorn).

KENT. Common all over North-west Kent, especially round Lewisham, Elmstead, Joyden's Wood, Shooter's Hill (Owen) and Petts Wood (F. Swain).

**Pyrgus malvae* Linn.—M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This familiar little butterfly, the Grizzled Skipper, is our only representative of a large group of this Family found on the Continent, having a somewhat similar chequered black and white pattern and often only distinguishable by the underside markings. It appears in May and is often common in most parts of the London Area as well as in the British Isles.

In SURREY it has been reported as plentiful from Wimbledon Common (D. King) and Banstead (Menzies), from Ham Common (R. Smith) and common at Esher in 1944 and 1946 (Stallwood), at Ashtead (Russwurm) and at Oxshott (Sterling).

In MIDDLESEX round Hendon and Hanger Hill (R. Smith), also at Northwood and Brent Reservoir (Martin).

In HERTS from Broxbourne (B. Thorn). Reported in 1898 from Wanstead.

In KENT it is recorded as local in the Lewisham area and round Farnborough and abundant in 1947 at Abbey Wood and on Hayes Common (Owen).

**Thymolecus sylvestris* Pod.—M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

The Small Skipper is a very common species all over the Southern part of the British Isles, appearing in late June and frequenting every type of terrain. Widespread in the London Area.

Reported from SURREY as very common at Bookham in 1947 (Garrett Jones) and at Oxshott, Ashtead and New Malden (Sterling), but infrequent in Richmond Park (Collenette). Some 600 observed round at Northwood and Northwick Park (Martin).

In MIDDLESEX it was seen at Twickenham in 1946 (Stallwood) and at Northwood and Northwich Park (Martin).

In KENT it is generally distributed in the Lewisham area and in the woods and on the downs of north-west Kent, also along the Thames by Swanscombe (Longfield).

Thymolecus lineola Ochs.—K.16, E2.18.

The Essex Skipper may be said to be our newest butterfly, only having been discovered to occur in the British Isles in the early nineties of the last century. It is smaller on the whole than the previous species and is at once distinguished by the black tips to the antennae. At first found in Essex, it is now known to occur in many southern counties ranging to Somerset. In the London Area it has been reported from

KENT with the previous species along the Thames Estuary (Longfield) and as very common in 1947 in the Lewisham area, Plumstead, Greenwich, Deptford and Sundridge Park (Owen), and at Petts Wood (F. Swain). Abundant at Eynsford in 1948 (Burton).

In ESSEX it is plentiful at Purfleet (Bowden) and common locally in the Brentwood area (Williams). It flies during July in company with *Th. sylvestris.*

**Hesperia comma* Linn.—K.16, S.17.

This pretty little insect, the Pearl Skipper, is very local and only affects chalk downs in August in the southern counties. In the London Area it is only recorded from SURREY at Boxhill and in that vicinity along the downs (Stallwood) and from KENT at Magpie Bottom, Shoreham (Owen). In the 1878 list it is recorded from Croydon.

**Augiades sylvanus* Esp. (*Ochlodes venata*).—I.L., M.21, H.20, E2.18, E1.19, K.16, S.17, B.24.

This very common member of this family, the Large Skipper, is found in all parts of the London Area and in nearly every region of the British Isles. It appears in late June.

In SURREY it has been seen commonly at Sheen, on Wimbledon Common and at Putney (D. King) and also in Richmond Park (Collenette) and reported as plentiful at Oxshott and Hinchley Wood from 1943 to 1946 (Stallwood).

In South-east SURREY it was common on waste ground in the New Malden district (Sterling) and especially in 1933 on Epsom Golf Course (D. King).

In MIDDLESEX it was very numerous round Northwood in 1945 (Martin) and in 1946 was locally common on Hanger Hill (R. Smith).

In INNER LONDON one was seen on the Cripplegate area in July 1947 (Currie). Reported from Broxbourne (B. Thorn) and reported as plentiful locally and well distributed throughout HERTS (Foster, *Lep. Herts.*, 1937) and also numerous in suitable localities in ESSEX (Williams). In KENT it is reported as of wide range, but not generally common round Bickley and Farnborough (Browning) and was particularly plentiful in 1946 almost on every grassy patch in the Lewisham area, Greenwich Park, Hayes Common, Joyden's Wood (Owen) and in the Pett's Wood district (Swain).

City Bombed Sites Survey.

Progress Report.

DURING the third year of the survey work has been continued on the birds and plants of the bombed site at Cripplegate, and a certain amount of work has also been done on the insects. A paper by Mr D. F. Owen on the macrolepidoptera appeared in the *Entomologist*, Vol. LXXXI, March 1949, pp. 59-62. More assistance from entomologists would be very welcome. There is quite a rich and varied insect fauna. The botanists, under Mr F. E. Wrighton, have prepared a list of the plants found in the area and this appears on page 85.

Some Notes on the Birds of the Bombed Sites.

By P. W. E. Currie.

These few notes make no pretence to be anything like a complete study of the birds of the Cripplegate bombed sites. The few hours spent in the area in the afternoons of the monthly visits are insufficient for a serious study of the birds, or even for a reasonable census of the area. In addition the presence of the Black Redstart has proved a distracting factor, and the majority of the ornithologists who come on the monthly visits do so principally with the object of seeing this one species. However, it may perhaps be worth while to place these scattered notes on record. Apart from the resident species, the list of the species which visit the area is interesting in some ways. Certain species appear with sufficient frequency to suggest that the area has some attraction for them, though not enough to persuade them to stay. For example, the Whinchat is not such a common bird in central London that its three occurrences in two years can be lightly dismissed. Other species which might have been expected to turn up fairly regularly have failed to do so.

The notes given below are divided into two sections, the first on the species which breed or are presumed to breed in the area, and the second on the visitors and passage migrants. I am indebted to those who have assisted me on the monthly visits, whose notes have been communicated verbally, and also to Messrs D. V. Freshwater, S. D. Herington and N. J. P. Wadley for the detailed notes resulting from their frequent visits at other times. I am also obliged to Mr W. G. Teagle for allowing me to extract a number of records by Professor E. H. Warmington, Mr R. B. Warren and others from the Inner London record cards of the Ornithological Section. The English names used in this paper are those used in *The Handbook of British Birds.* A general description of the area, which comprises about 55 acres, will be found in the *London Naturalist* for 1947, No. 27, at page 44.

THE BREEDING SPECIES.

STARLING. Numbers fluctuate widely, from one or two to 100 or more (on 3 April 1948 three parties totalled 108, and there were others uncounted). Evidence of breeding is scanty, but probably up to 6 pairs do so. They apparently raise only one brood, which is fledged by mid-May, after which most of the birds leave the area. They are then seen only in small numbers (5 or 6) until the autumn, when numbers rise to 30 or more. Feeding takes place mainly, if not exclusively, about the roots of *Senecio*, *Epilobium*, etc. In the shallow humus there are many noctuid larvae, beetle imagines and larvae, ants, spiders, centipedes and woodlice, all of which must be readily available to the feeding methods of the Starling.

At some periods of the autumn very large numbers (several thousands) roost in Finsbury Circus, just to the East of the survey area, but there is no reason to suppose that these birds frequent the survey area for any other purpose.

HOUSE SPARROW. This is undoubtedly the dominant species of the bombed sites, but relatively few appear to breed actually in the survey area, though there is no lack of suitable nest sites in the buildings that remain standing. In fact, no definite breeding record appears in my notes, but this is probably a reflection of the lack of attention of observers. At a site North of Chiswell Street several pairs were seen carrying food to nests in a damaged cavity brick ceiling near some stables on 24 July 1947.

Numbers vary from about 20 to over 400 (3 April 1947, not less than 430). Two counts on 27 Sept. 1947 gave figures of 156 in the morning (1130-1330 hrs.) and about 160 in the afternoon (1430-1600 hrs.). A count of about half the area on 25 Sept. 1948 gave a figure of 71.

This population resorts to the area for various purposes:

i. Feeding. This is a social activity, parties of up to 50 being seen feeding about the roots of *Senecio*, *Epilobium*, etc., in company with Starlings, or, less often, on the seeding heads of these and other plants. Food seen to be taken includes seeds of thistles (sp.?), *Epilobium* and *Chenopodium*; aphides on thistles, *Senecio* and *Salix*; a large brown noctuid larva (twice); and other unidentified arthropods. Most feeding takes place on the ground, about the roots of plants, often in dense cover. They also often feed in the roads. There is still much horse traffic in this part of the City, and it is reasonable to suppose that the availability of food in horse droppings and scatterings from nosebags and round the stables has something to do with the abundance of Sparrows.

ii. Bathing and Drinking. A basement by the Coachman's house, which contains shallow water at most times of the year, and one or two other places where water collects after rain, are often used for these purposes by parties of up to 50. The more permanent water in the E.W.S. tanks beside the H.A.C. grounds is a regular resort; this is just outside the survey area.

iii. Dusting. In sunny weather many birds can be seen dust bathing in suitable places.

iv. Social Gatherings. Generally a large proportion of the birds present in the area will be found sitting in the *Salix* bushes, doing nothing in particular, though there is often a good deal of noise and movement in these parties. A particularly favoured spot was a collection of iron rods, such as are used to reinforce concrete, in the area North of Moorgate Station; from this over 200 were disturbed on 3 April 1948.

PIED WAGTAIL. One or two pairs have bred successfully in the survey area in each year of the survey. Although they feed regularly on the floors of the E.W.S. tanks and round the edges of the sumps in these tanks, they feed also on the open, relatively unvegetated spaces, which are suited to their technique of catching their prey by running.

BLACKBIRD. A pair was present throughout the spring and summer of 1948, and in 1949 a pair bred twice; the second brood was found dead in the nest. These birds are very shy and elusive, perhaps owing to the abundant cats, and their feeding habits have not been noted. They frequent the deepest basements, to the East of Wood Street.

BLACK REDSTART. Although this species is characteristic of the bombed sites, which are indeed its principal habitat in the London area, it is not proposed to deal with it here at any length. Details of the numbers present in each year and of their breeding may be found in the *London Bird Report* for the respective years. Four to six pairs breed in the survey area, and the birds are present from about the end of March to the end of October, with one or two occasionally in the winter months. Their food is presumably mainly insects and other arthropods, though they have been seen to take elder berries. Their prey is mainly captured on walls, on bare ground, or in flight from some prominent position, and they are seldom seen searching on vegetation.

KESTREL. One or more are regularly seen, and it is probable that a pair breeds in or near the area, though there seems to be no positive proof of breeding in any of the years of the survey. They have been seen to attack sparrows, and it is reasonable to suppose that these form a considerable item in their diet, since mice can hardly be abundant in daylight in the City.

WOOD PIGEON. Two or three pairs are regularly present, feeding mainly in the roads, but also on bare ground in the basements. The only trees in the survey area suitable for nesting are the plane trees in the garden of St Giles', but this species is known to nest occasionally on buildings.

LONDON PIGEON. Although this is not recognised as a wild species, it would be absurd to omit it from this list. There are, however, surprisingly few in the survey area, and it is seldom seen feeding anywhere except in the roads. There are probably not more than 6-8 pairs present.

Visitors and Passage Migrants.

Crow. One or two seen March-May and Oct.-Dec.

Goldfinch. A party of about 10 spent the winter 1948-9 in the area, and others have been seen in the winter months. They have been reported as apparently feeding on the " fruit " of plane trees, 7 March 1949 (R.B.W.).

Linnet. A male seen on 26 Feb., 15 March and 8 April 1949 (R.B.W., E.H.W. and others).

Yellow Wagtail. One, 7 May 1949 (D.V.F.); one, probably juvenile, 29 Aug. 1949 (N.J.P.W.).

Grey Wagtail. One or two regularly in autumn (Sept.-Nov.), less frequently in winter and early spring.

Great Tit. One, March 1947 (S.D.H.); one, 5 Oct.-24 Nov. 1949 (N.J.P.W., R.B.W., S.D.H.).

Blue Tit. A few have been seen in previous winters, but in Sept. and Oct. 1949 they were abundant (not less than 10), and parties were still present in Dec. 1949.

Spotted Flycatcher. One, 26 May 1949 (N.J.P.W., S.D.H.).

Willow Warbler. In April-May and July-Sept. odd leaf-warblers are regularly seen, but they are usually difficult to identify in the dense cover. Willow Warblers have been positively identified on several occasions.

Garden Warbler. One, St Giles' churchyard, 30 Apr. 1949 (S.D.H.).

Whitethroat. One, female or juvenile, in an elder bush, 27 Aug. 1949 (P.W.E.C.).

Song Thrush. One, March 1947 (S.D.H.).

Wheatear. April-May and Sept., one or two frequently seen.

Whinchat. One each in May and Sept. 1948 (D. F. Owen, S.D.H.) and June 1949 (N.J.P.W.).

Redstart. A female, 18 May 1949 (N.J.P.W.).

Robin. One each on 2 Dec. 1948 (S.D.H.), 1 Apr. 1949 (R.B.W.), 8 Oct. 1949 (N.J.P.W.) and 1 Nov. 1949 (R.B.W.).

Wren. One on various dates 8 Oct.-9 Dec. 1949 (many observers).

Swallow, House-Martin, Swift. All these species have occasionally been seen flying over the area.

Great Spotted Woodpecker. One picked up dead in the yard of the Coachman's house, c. 20 July 1949 (N.J.P.W.).

Little Owl One 7, 12, 17 Oct. 1949 (N.J.P.W., E.H.W., A. W. Bartlett). One flying over Wood Street, 16 Jan. 1950 (D.V.F.).

Mallard. Odd birds, and sometimes pairs, are seen every year, April-June, in the E.W.S. tanks. It is, of course, well known that this species occasionally nests on buildings or in E.W.S. tanks in London.

Plant Ecology at Cripplegate, 1949.

By F. E. Wrighton.

Work has continued steadily during the year, and monthly visits have been made to the sites. The quadrats and transects laid down in the Spring of 1948 are showing interesting changes, and a total of 16 such areas are now under observation. As was expected, several of the observed communities have been destroyed by human activity, but provision was made for this by having a relatively large number of quadrats as described in the 1948 report. Interference takes place in various ways and may be due to the dumping of rubbish (though this is illegal), the deliberate removal of plants, or the undue trampling of an area by children at play. An unusual or attractive flower is very likely to be removed; as an example, the case of *Cichorium intybus* L. can be quoted. The first plant of this species to be noted on the area was seen near Fore St. in June this year. It was then in bud, but a month later no trace of the plant could be found. Again, a single colony of *Typha latifolia* L. was developing in a permanently wet sump; one plant was seen in 1947, 5 in 1948, and then all were removed.

Interference with the trees is, perhaps, the most widespread. It occurs continuously and consists of the cutting of willows for catkins, and of other species for sticks, or possibly for firewood. The trees are not killed by this treatment, but normal development is prohibited, and shrubby or coppiced forms are becoming common. Despite these setbacks, the woody perennials are making headway in their colonization, and a serious attempt to record this progress would be desirable. The largest specimens are willows, *Salix alba* L., *S. fragilis* L., *S. viminalis* L., *S. caprea* L., *S. atrocinerea* Brot. and hybrids, the oldest being probably of 8 or 9 years' growth. Next comes *Betula alba* L. with a somewhat slower development, the biggest of which appear to be about 6 or 7 years old. Of the others, *Sambucus nigra* L. and *Populus nigra* L. are well established, though in smaller numbers.

The main feature of this year's report is a list giving the names of plants recorded from the area during the past three years. It has been arranged in two parts in order to differentiate more clearly between garden hybrids (products of the nurseryman or the plant breeder, which are difficult to define accurately) and natural species which have been reasonably well described and named.

The writer wishes to offer thanks to Miss M. A. Scholey and Dr J. K. Hasler for their sustained and valuable work in exploring the sites; to Mr C. P. Castell and Mr J. H. G. Peterken for work on the Bryophytes; and to Mr J. E. Lousley for checking the naming of certain of the flowering plants.

Cultivated Forms.

In all cases, except, perhaps, in that of *Saponaria*, these plants can be regarded as rare, and, so far as can be seen, have little influence on the succession.

Aquilegia hybrida	(Columbine).
Eschscholtzia californica	(Californian Poppy).
Papaver rhœas	(Shirley Poppy).
P. somniferum	(Opium Poppy).
Beta cicla	(Spinach Beet).
Brassica oleracea	(Cabbage).
Matthiola incana	(Stock).
Lunaria biennis	(Honesty).
Saponaria officinalis	(Soapwort).
Lychnis coronaria	(Rose Campion).
Cerastium tomentosum	(Snow in Summer)
Althæa rosea	(Hollyhock).
Tropæolum majus	(Nasturtium).
Pisum sativum	(Pea).
Sedum acre	(Stonecrop).
Peucedanum sativum	(Parsnip).
Calendula officinalis	(Marigold).
Aster tradescanti	(Michaelmas Daisy)
Solanum tuberosum	(Potato).
S. lycopersicum	(Tomato).
Ficus carica	(Fig).
Allium cepa	(Onion).
Asparagus officinalis	(Asparagus).
Iris sibirica	(Flag).
Triticum hybernum	(Wheat).
Hordeum sativum	(Barley).
Avena sativa	(Oats).

NATURAL SPECIES.

In the following list symbols of frequency have been included, thus:

r	rare.
o	occasional.
f	frequent.
a	abundant.
d	dominant.

And in combination:

l	locally.
v	very.

Name of Plant.	*Frequency symbol.*	*Remarks*
Papaver rhœas L.	r	
P. atlanticum (Ball) Cosson.	o	
Radicula islandica Druce.	l f	
Sisymbrium officinale Scop.	l f	
S. orientale L.	l a	
Erysimum cheiranthoides L.	o	
Brassica arvensis Kuntze.	r	
B. campestris L.	r	One group noted
Diplotaxis tenuifolia DC.	l a	
D. muralis DC.	o	
Capsella bursa-pastoris Med.	f	
Coronopus didymus Sm.	r	
Lepidium ruderale L.	l f	
Silene inflata Sm.	r	
Lychnis alba Mill.	o	
L. dioica L.	o	
Cerastium vulgatum L.	f	

Name of Plant.	*Frequency symbol.*	*Remarks.*
Stellaria media Vill.	f	
Arenaria serpyllifolia L.	r	Possibly extinct.
Sagina procumbens L.	l a	
S. apetala Ard.	l a	
Malva sylvestris L.		
Acer pseudo-platanus L.	r	
Aesculus hippocastanum L.	r	
Medicago falcata L.	r	One plant noted
M. lupulina L.	o	
Melilotus alba Desr.	r	
M. arvensis Wallr.	o	
Vicia cracca L.	r	
Trifolium dubium Sibth.	r	
T. repens L.	f	
T. pratense L.	o	
Colutea arborescens L.	r	One group noted
Rubus fruticosus L.	r	
Potentilla anserina L.	r	
P. reptans L.	r	One colony noted
Platanus orientalis L.	r	
Epilobium angustifolium L.	a	
E. hirsutum L.	f	
E. montanum L.	f	
E. obscurum Schreb.	f	
Oenothera biennis L.	o	
Aethusa cynapium L.	r	Possibly extinct
Heracleum sphondylium L.	r	
Sambucus nigra L.	o	
Galium aparine L.	r	Possibly extinct.
Dipsacus sylvestris Huds.	r	One plant noted.
Erigeron canadensis L.	v a	
Galinsoga parviflora Cav.	r	
Achillea millefolium L.	r	
Chrysanthemum parthenium Bernh.	r	
C. leucanthemum L.	r	One plant noted
Matricaria inodora L.	r	
M. discoidea DC.	r	Very local colonies
Artemisia absinthium L.	r	
A. vulgaris L.	f	
Tussilago farfara L.	a	
Senecio vulgaris L.	r	
S. viscosus L.	r	Possibly extinct.
S. squalidus L.	v a	
Cirsium lanceolatum Scop.	a	
C. arvense Scop.	a	
Cichorium intybus L.	r	Possibly extinct.
Hypochæris radicata L.	r	
Taraxacum vulgare Lam.	f	
Lactuca serriola L.	f	
Sonchus oleraceus L.	f	
S. arvensis L.	r	Three groups noted
Buddleia davidi Franch.	r	
Convolvulus arvensis L.	l f	
Calystegia sepium Br.	r	
Solanum dulcamara L.	r	
S. nigrum L.	r	
Verbascum thapsus L.	r	One group noted.
Linaria purpurea Mill.	o	
L. cymbalaria Mill.	r	One group noted.

Name of Plant.	*Frequency symbol.*	*Remarks.*
Digitalis purpurea L.	r	Possibly extinct.
Mentha arvensis L.	r	Possibly extinct.
Galeopsis tetrahit L.	r	
Ballota nigra L.	r	
Plantago major L.	l a	
P. lanceolata L.	l a	
Chenopodium album L.	v a	
C. rubrum L.	l a	
C. polyspermum L.	l a	
Atriplex hastata L.	f	
A. patula L.	o	
Polygonum aviculare L.	o	
P. convolvulus L.	r	
Rumex crispus L.	f	
R. obtusifolius L.	f	
R. acetosa L.	r	
R. acetosella L.	r	
Mercurialis annua L.	r	
Urtica dioica L.	r	A few small groups.
Parietaria officinalis L.	l a	
Betula alba L.	f	
Salix alba L.	r	
S. fragilis L.	r	
S. viminalis L.	o	
S. caprea L.	f	
S. atrocinerea Brot.	f	
Populus alba L.	r	One plant noted.
P. nigra L.	r	
Juncus inflexus L.	r	Possibly extinct.
Typha latifolia L.	r	Possibly extinct.
Alopecurus pratensis L.	r	
Phleum pratense L.	r	
Agrostis stolonifera L.	a	
A. nigra Druce.	o	
Deschampsia cæspitosa Beauv.	r	Two plants noted.
Holcus lanatus L.	a	
Dactylis glomerata L.	f	
Poa annua L.	v a	
P. pratensis L.	a	
P. angustifolia L.	f	
P. trivialis L.	a	
Festuca rigida Kunth.	r	One colony noted.
F. rubra L.	o	
F. tenuifolia Sibth.	r	Four plants noted.
Bromus sterilis L.	o	
B. hordeaceus L.	o	
Lolium perenne L.	a	
L. multiflorum Lam.	r	
Agropyron repens Beauv.	f	
Hordeum murinum L.	a	
Pteris aquilina L.	l a	

In the following list of Bryophytes the frequency symbols have been omitted, the data being, as yet, incomplete.

Marchantia polymorpha L.
Funaria hygrometrica Sibth.
Tortula muralis Hedw.
Bryum argenteum L.
B. cæspiticium L.
B. atropurpureum W. & M.
Ceratodon purpureus Brid.
Barbula unguiculata Hedw.
Bryum erythrocarpum Schwaeg.

The Survey of Bookham Common.

EIGHTH YEAR.

Progress Report.

ALTHOUGH progress in any one year is never likely to be spectacular, the papers which follow show that much hard work has been going on over a period of years and is now producing valuable results. The re-filling of some of the ponds after repairs to their banks will provide many problems for study; one aspect is commented upon below by Col. Bensley.

Messrs Bangerter and Castell have paid some attention to the vegetation of parts of E. Wood, and have continued to investigate that of E. Plain with special reference to the gun-pits. In an endeavour to throw some light on the varying water content of the pits, levelling was undertaken and, under the direction of Dr Hayward, the Geological Section visited the Plain to investigate the soil composition and depth to London Clay in the pits by augering. A surprising development and thickness of sandy soil was encountered, and another visit has been arranged for the coming year.

Work on spiders has, unfortunately, ceased with the departure overseas of Mr Le Gros; he is, however, writing up his notes for eventual publication in the *L.N.* The results of the activities of the dipterists will be found in Mr Parmenter's paper on p. 98.

The ornithologists continued their investigations into the bird population of the plains, an account of which by Mr Currie appears on p. 92.

I am indebted to Col. Bensley for the following report on mollusca and to Dr Beven for that on the birds of E. Wood.

FRESHWATER MOLLUSCA. The Progress Report for 1948 showed the position of the molluscan population as affected by the drainage and repair operations carried out that year. During 1949, the Isle of Wight and Lower Eastern Ponds began to settle down and aquatic plants to appear. The abnormally dry summer, however, caused both ponds to be practically dry by August, but there were already signs that a molluscan repopulation had begun. By then, young *Planorbis corneus* were fairly numerous and there was also an occasional young *Planorbis planorbis*. It should be noted that *P. corneus* seems most tenaceous of its habitat, being the last to disappear and the first to reappear, indicating that some individuals at any rate can survive long periods of drought. By November, young *Lymnaea peregra* were also fairly numerous, and there were a few *L. palustris*. The situation in Lower Eastern Pond is slightly different. After the new embankment was made in 1948, water appeared in the pond for the first time for many years. Though the Crustacean, *Gammarus pulex*, was noted in April 1949, no mollusca were observed until November 1949, when *Lymnaea peregra*, *L. palustris* and *Planorbis corneus* were fairly plentiful. *L. peregra* seems the commonest mollusc in Lower Eastern Pond, and *P.*

corneus does not hold the position here that it does in the Isle of Wight Pond.

Upper Eastern Pond shows signs of having suffered from the dry summer, when it was practically dry by August and had not recovered its usual large population of *P. planorbis* and *P. vortex* by the end of the year. Bookham Stream and associated ditches were cleared in 1948 and the stream has run freely since. There is no sign yet of its repopulation by mollusca.

The gun-pits on Eastern Plain are being kept under observation and pit C looks like being a permanent pond. *Pisidium obtusale* (determined by Mr A. E. Ellis) is well established and one or two other species have been noted from time to time but they have not established themselves. It is interesting to speculate how these casuals got there, the rubber boots of the more aquatic members of the survey team being a possible means of distribution. Several land molluscs are found fairly regularly in some of the other gun-pits which are usually free from standing water. It is hoped to be able to go into these more fully at some future date.

BIRDS. Throughout the year, mapping has been continued of birds of all species in Eastern Wood, with special reference, however, to Robins and Wrens. Mr Currie and his small but regular band of assistants have made steady progress and the data collected during 1949 were probably more detailed than in the previous years. The approximate number of territories for Eastern Wood, an area of about 40 acres, for the two species was Wrens 16 and Robins 22, with parts of the territories of two more birds. It is hoped to compare all these results with the information collected since 1946, for at least some of the species, when the 1950 figures are available. A crude map has been prepared showing the approximate areas of distribution of the different densities of trees and undergrowth, and work is going on to examine the way the distribution of birds may be correlated with the thickness and character of the woodland. The map emphasises the variety of habitats even in this small area and shows how complicated the problems of woodland ecology may be.

C. P. C.

Plant Galls of Bookham Common.

By M. NIBLETT, F.R.E.S.

The following list of Plant Galls are additions to the very comprehensive list compiled by Mr H. J. Burkill, and published in the *London Naturalist* for 1945. It contains only species which have been definitely determined; there are still a few additional galls not included, owing to there being some doubt as to their identity.

CYNIPIDAE.

Aulacidea pilosellae Kieff. on *Hieracium pilosella* L.
Rhodites dispar Niblett on *Rosa arvensis* L., *R. canina* L.
R. eglanteriae Hart. on *Rosa canina* L.
The above two species have been verified by breeding, it being impossible to distinguish them by their galls which are identical in form.
Xestophanes potentillae Vill. on *Potentilla reptans* L.

TRYPETIDAE.

Myopites blotii Bréb. on *Pulicaria dysenterica* L.
Oxyna flavipennis H. Lw. on *Achillea millefolium* L.

CECIDOMYIIDAE.

Anabremia viciae Kieff on *Vicia cracca* L.
Anisostephus betulinum Kieff. on *Betula pubescens* Ehrh.
Contarinia jacobaeae H. Lw. on *Senecio erucifolius* L.
C. lonicerearum F. Lw. on *Viburnum opulus* L.
C. loti Deg. on *Lotus corniculatus* L.
C. loti Deg. on *Lotus uliginosus* Schk.
C. pilosellae Kieff. on *Hieracium pilosella* L.
C. tragoponis Kieff. on *Tragopogon pratensis* L.
C. tremulae Kieff. on *Populus tremula* L.
Dasyneura aparines Kieff. on *Galium aparine* L.
D. loewiana Rübs. on *Vicia tetrasperma* Moench.
D. oxyacanthae Rübs. on *Crataegus monogyna* Jacq.
D. populeti Rübs. on *Populus tremula* L.
D. spadicea Rübs. on *Vicia cracca* L.
Harmandia populi Rübs. on *Populus tremula* L.
Lasioptera carophila F. Lw. on *Angelica sylvestris* L.
L. populnea Wachtl. on *Populus tremula* L.
Kiefferia pimpinellae F. Lw. on *Angelica sylvestris* L.
Placochela nigripes F. Lw. on *Sambucus nigra* L.
Plemeliella betulicola Rübs. on *Betula pubescens* Ehrh.
Plutoniella marsupialis F. Lw. on *Prunus spinosa* L.
Taxomyia taxi Inchb. on *Taxus baccata* L.
Zygiobia carpini F. Lw. on *Carpinus betulus* L.

ERIOPHYIDAE.

Eriophyes dispar Nal. on *Populus tremula* L.
E. galiobius Can. on *Galium uliginosum* L.
E. pseudoplatani Corti. on *Acer pseudoplatanus* L.
E. rudis longisetosus Nal. on *Betula pubescens* Ehrh.
Phyllocoptes anthobius Nal. on *Galium palustre* L., *G. saxatile* L.
P. populi Nal. on *Populus tremula* L.

FUNGI.

Coniothryium tumaefaciens Güss. on *Rubus fruticosus* L.
Entyloma microsporum Schrött. on *Ranunculus repens* L.
Phragmidium subcorticium Schrk. on *Rosa arvensis* L.
Puccinia galii Pers. on *Galium palustre* L.
Triphragmium ulmariae Lk. on *Spiraea ulmaria* L.
Uromyces ficariae Schum. on *Ficaria verna* Huds.

Pea Galls of *Rhodites* Spp. (Cynipidae) on *Rosa* Spp.

During the period 1941-1946, inclusive, while carrying out my investigations on the Pea Galls of *Rhodites* spp., I collected on Bookham Common 3650 smooth galls. From these there emerged 85 *Rhodites* *dispar* Niblett and 83 *R. eglanteriae* Hart.; in addition, 2740 parasites and inquilines were bred, of the former there were 1891 Chalcids of the following species: *Torymus auratus* Fourc., *Eurytoma rosae* Nees., *Oligosthenus stigma* F., *Habrocytus bedegauris* Thoms., and an unidentified *Tetrastichus* sp. There were 57 Ichneumons, *Orthopelmar brevicornis* Gir. The inquilines to the number of 792 were *Periclistus caninae* Hart.

The majority of the galls collected were taken from *Rosa canina* L., a small percentage taken from *Rosa arvensis* L. yielded 36 *Rhodites dispar.* All the *Rhodites eglanteriae* emerged from galls taken from *Rosa canina.*

Only 3 spiked galls were found during the whole period, they were on *Rosa canina* and yielded no insects; it is safe to assume that they were caused by *R. dispar* however, this species being responsible for spiked galls in all the surrounding areas.

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—— (1947). The Species of *Rhodites* Causing Pea-galls on *Rosa*, II. *Entomologist*, 80: 121-127.

Notes on the Summer Resident Birds of the Western Plains.

By P. W. E. Currie.

On 16th March 1948 the grass of the greater part of the plains area of the Common was deliberately burnt in order to " improve the grazing." The areas affected were the whole of Bank's Plain, Western Plain, I.O.W. Plain and Bayfield Plain, except a belt of varying width beside the streams, which was evidently too damp to burn. Western Scrub (sq. 42) also withstood the burning. The fire appears to have passed rapidly over the ground, driven by a S.S.W. wind, and effectively cleared all dry grass and bracken without seriously damaging the growing plants or the dormant roots below; but some scrub, especially blackthorn and bramble, was killed, no doubt partly as a result of the burning of the dead bracken at its base.

This occurrence turned attention to the birds of the affected area, and it was decided to attempt to ascertain whether the burning would have any effect on the size or composition of the breeding population of birds. The area selected for study is that lying West of the line Isle of Wight Road (8482-8158)—Isle of Wight Ditch-Isle of Wight-Common Road (5479-4221), and comprises the whole of the area affected by the fire, about 65 acres. It is an open area, rising towards Bayfield in the South West and towards the wooded area in the North East, and with a system of streams and ditches and an associated alluvial belt running from South East to North West and having a gradual drop of about 40 feet. This alluvial belt is marshy, and at times waterlogged. The remainder of the area is drier and better drained, mainly grassy, with scattered hawthorn and bramble bushes and blackthorn clumps, and some areas of bracken on the higher ground. It is bounded on the East by the main woods of the Common, on the West and North by a hedge with high trees, with cultivated fields beyond. Central Plain, to the South East, was also included in the survey; but as this was not affected by the fire, it has been omitted from this paper. This omission accounts for the discrepancies between the figures given here and those given in last year's progress report (*London Naturalist*, No. 28, p. 46). Central Plain is too small an area, and differs too much in character from the ground dealt with in this paper for it to be useful as a control.

Owing to the size of the area, it was clearly impossible to attempt a complete census. It was therefore decided to map the song posts of the principal summer resident species, noting at the same time any other information confirmatory of breeding. The method adopted was to wander over the area in such a way as to cover as much of the ground as possible, noting all observations directly on to 1/2500 maps. These data were subsequently entered under species in a loose-leaf notebook, and also copied on separate maps for each species. On the days of the monthly visits (in heavy type in the following list), when several observers were available, the area was parcelled out into sections, each of which was allotted to one or more observers. On the other dates the area was visited by the writer alone. The area was visited in 1948 on **11**, 18 and 24 April, and 2, **9**, 17 and 23 May; and in 1949 on **10**, 15, 16, 17 and 24 April, 1, **8**, 22 and 29 May, and 3, 4, 5, and 6 June. Nearly all the visits were made in the morning, between 0930 and 1300 hours in 1948, and between 0830 and 1300 hours in 1949. Unfortunately, as will be seen, the results for the two years are not strictly comparable, since visits in 1949 were more frequent, of longer duration, and started earlier in the morning. In addition, the writer and other observers no doubt gained in skill with experience. A further complicating factor is the after-effects of the severe weather in early 1947, from which the resident species may not have fully recovered. This, however, does not affect the summer immigrants.

At the best, a count of singing males does not provide an accurate picture of a breeding population. It does, however, provide some indication of the order of density of the population, of the size of territories, and of the types of habitats selected by the various species. It has therefore seemed desirable to place these results on record for what they are worth, especially since the writer will be unable in future seasons to repeat the very frequent visits on which this paper is largely based.

There are no exactly comparable figures in the earlier publications of the Bookham Common survey. Those given by Mr A. R. Wilton in the *London Naturalist* for 1943 (p. 23 et seqq.) represent an attempt to make a census of the singing birds of the whole Common. Although some of the figures agree reasonably well with those given here, the

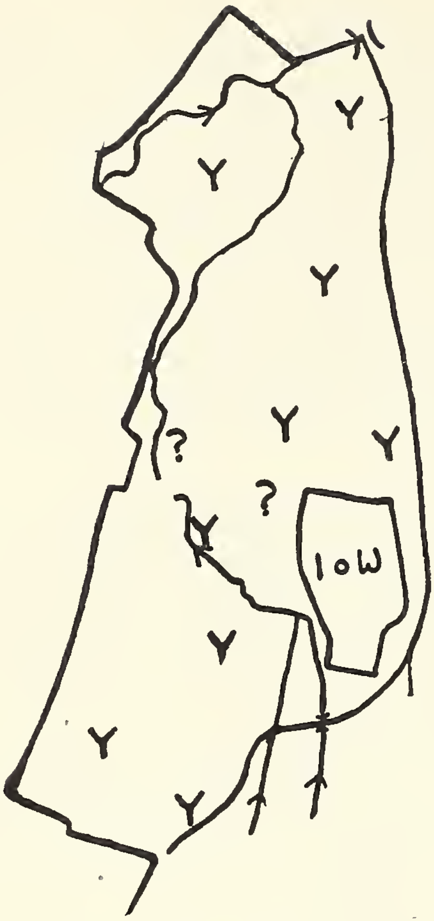

Fig. 1.
Yellow Bunting, 1948.

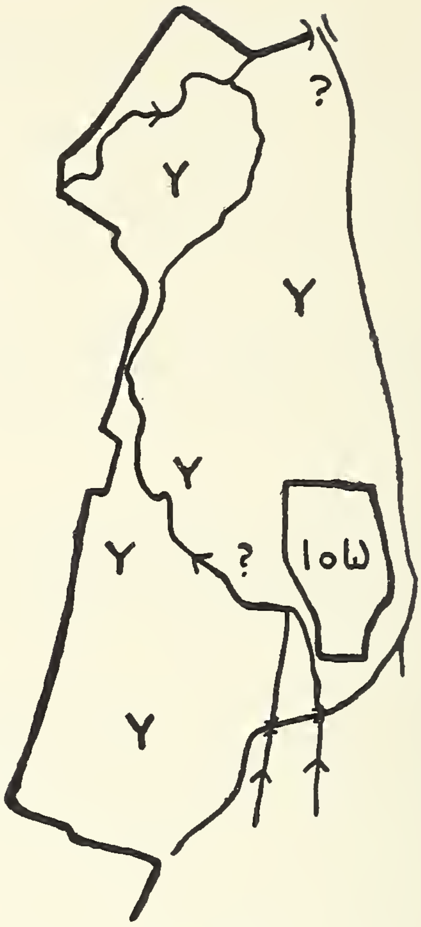

Fig. 2.
Yellow Bunting, 1949.

difference with others is very great. Mr Wilton, it is understood, made his census unaided, and it seems probable that he was unable to cover the ground as thoroughly or to devote as much time to each area as was possible in the present study. Nevertheless, it is evident that certain changes have taken place. Thus Mr Wilton says of the Skylark that " probably three pairs nest at Bayfield and Western Plains." This species no longer nests on the Common, and it is indeed seldom seen there except during hard weather. On the other hand, the Yellow Bunting was described in 1943 as " not a common species, although their numbers are augmented during the winter months " : this is now a common breeding species, but comparatively few are seen in winter.

For the purpose of this paper eight species have been selected for study, and these have been divided into four groups, each of two species: (a) the birds of the alluvial belt; (b) the ground nesting birds of the open plains; (c) the birds characteristic of scrub and bushes; and (d) the birds associated with trees and the margins of woods. The figures given for each species in what follows represent those observations which were confirmed on a second visit, or where there was confirmatory evidence of breeding. The figures in brackets represent the totals, including single observations and those where the correct allocation of territories is more than usually doubtful. The two sets of figures cannot however be taken as maxima and minima, though the unbracketed figures should be fairly reliable.

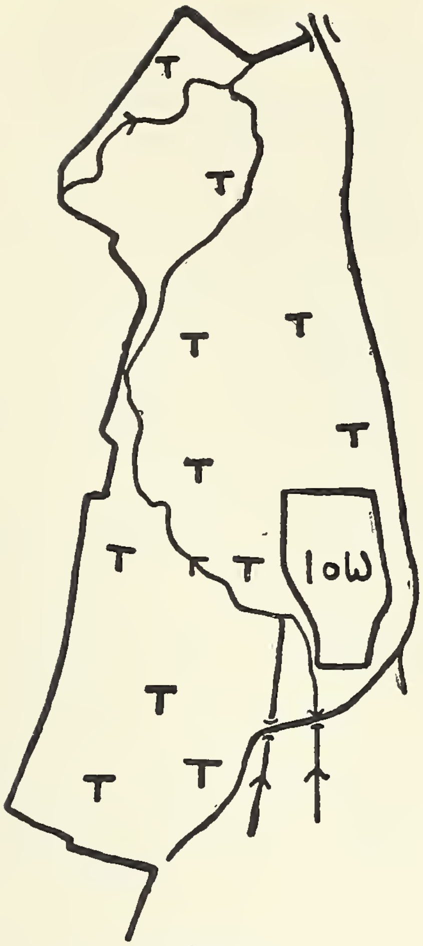

Fig. 3.

Tree Pipit, 1948.

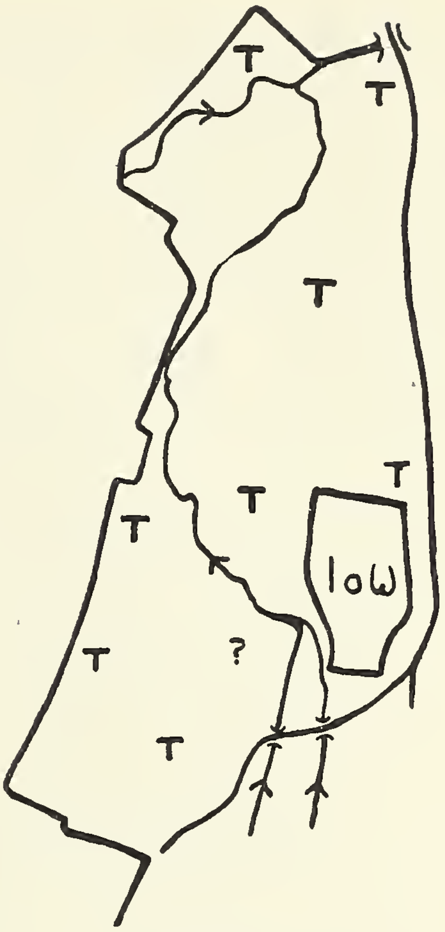

Fig. 4.

Tree Pipit, 1949.

A. *The birds of the alluvial belt.* The two species in this association are the Grasshopper Warbler and the Reed Bunting. Although both of them are found mainly, but not exclusively, along the course of the ditches and streams, the Reed Bunting is more closely restricted to this habitat, and those nests that have been found have all been placed very near to a stream, usually in a clump of *Juncus*. The Grasshopper Warbler is more typically a grassland bird, but tracts of long grass suitable for this species are found mainly beside the streams. Neither of these species shows any striking change in numbers in the two years; but the area which they occupy is that least affected by the fire. The figures are: Reed Bunting, 1948, 2 (3); 1949, 2. Grasshopper Warbler, 1948, 3 (5); 1949, 5 (6). It is very probable that the figures for the Grasshopper Warbler are incomplete in both years, since this species is notoriously elusive once nesting has begun.

B. *The ground nesting species of the open plain.* The two species in this association are the Yellow Bunting and the Tree Pipit. On Bookham Common their habitat requirements seem to be broadly similar, except that the Yellow Bunting appears to be more tolerant of bracken than any other species. Both are found chiefly in the drier and more elevated parts of the plains (though the Tree Pipit is also found on the flatter and damper Central Plain) and both require trees or bushes as song posts. The Tree Pipit has not been seen here to sing from a bush less than six feet high, but the Yellow Bunting does so occasionally.

The figures for Yellow Bunting show a decrease in 1949. In 1948 there were 9 (11); in 1949, 5 (7) (figs. 1 and 2). In each year there were also two pairs on Central Plain. The figures for Tree Pipit show a similar trend. For this species figures for 1947 are also available. The figures are as follow: 1947, 5 (6); 1948, 11 (fig. 3); 1949, 8 (9) (fig. 4). There were two or three pairs each year on Central Plain, and at least one pair on Eastern Plain. In 1943 Wilton (*loc. cit.*) recorded 9 song posts, but two of these were outside the area here studied. It should be added that this species is difficult to map, as the males have a propensity for wandering over a wide area, and the boundaries of the territories are not always very easy to ascertain.

C. *The birds of the scrub.* The two species here allocated to this association are the Whitethroat and the Hedge Sparrow. The figures for the Hedge Sparrow are probably not so reliable as those for other species. This is a retiring and inconspicuous species, and is most active in the earlier part of the season, when few counts were made in 1948. The figures are: 1948, 5 (11); 1949, 10 (18). The large number of unconfirmed records emphasises the difficulty of comparison, but even so there is an apparent increase. This species occurs in all those parts of the plains where there is abundant hawthorn or blackthorn scrub.

The Whitethroat, on the other hand, is a conspicuous species, and the only difficulty in mapping it arises from its abundance. The figures are: 1948, 14 (30); 1949, 27 (35). Wilton (*loc. cit.*) recorded only 9 song posts for the whole Common, of which three were outside the area here studied. It is hardly probable that an increase of this order has taken place since 1943. The species is very generally distributed over the plains wherever there is suitable cover, but it is not found in the open grassy areas where there is no scrub or tree. As the nest is usually built at a low level, and often in herbaceous vegetation, it seems likely that the presence or absence of a song post determines the suitability of a territory.

D. *The marginal species.* The two species classed here as marginal are the Chaffinch and Willow Warbler. Both these are usually associated (at least in the mind of the writer, if not also in fact) with the edges of woods rather than with open plains, and their distribution over the area under study supports this association. Both are to be found principally at the boundary between the woods and the plains, along the hedgerow bordering the Common on the West and North, and also in those areas where the scrub attains its greatest height and thickness. But smaller numbers are also found in the more open areas, and there is some evidence to suggest that the increase in numbers which both species show in 1949 is accounted for partly by birds which adopted territories in the more open areas. It is, of course, doubtful whether these areas were more attractive to these species when they had recovered from the burning, or whether an increase in the number of birds competing for territories resulted in more birds being forced to occupy unsuitable ground.

The figures are: Willow Warbler, 1948, 10 (21); 1949, 21 (28). Chaffinch, 1948, 18 (28); 1949, 33 (41). It should be added that the Willow Warbler, being an inconspicuous species with a quiet song, may sometimes fail to make its presence noticed as effectively as some other species.

In addition to the species dealt with above, a number of others are found in the area. These include the Blackbird, of which some 6-9 pairs were probably present; the Wren, which is not very abundant except in the scrub-covered areas, where it is naturally very difficult to observe accurately; the Magpie, of which several pairs nested in the densest blackthorn scrub near the margin of the woods; the Moorhen, which is seen, not very often, by the streams and ditches, but is no doubt generally present; the Red Backed Shrike and Turtle Dove, of which one or two pairs were present each year; Pheasants and Partridges; and a number of Robins and various occasional visitors or birds which come out of the woods to feed, such as the Tits (Blue and Great) which are often seen about the hawthorn bushes and the Green Woodpecker, which feeds at anthills.

The figures which have been given in this paper are here placed on record, not because the writer has any great confidence in their present value, nor because he believes that they justify any very significant conclusions, but rather in the hope that they may suggest lines of future study, and provide a basis for comparison. It is to be expected that there should be some fluctuations in numbers from year to year in any population of birds; and the fact that the figures given here for the two years are not strictly comparable makes the assessment of their meaning even more difficult. It is perhaps worth noting, however, that of the three resident species, which might have been expected to have been affected by the severe weather in 1947, two (Chaffinch and Hedge Sparrow) show the expected increase in 1949, but one (Yellow Bunting) shows a decrease; and that the only other species to show an apparent decrease is the Tree Pipit, which shares the same habitat with the Yellow Bunting. The figures for Yellow Bunting and Tree Pipit are sufficiently accurate to provide a basis for comparison in future years, and it should not be impossible to make reasonably accurate counts of these two species alone with far less expenditure of effort than was required to produce this paper.

The original maps from which this paper was prepared have been deposited with the Secretary of the Ecological Section, together with the maps for each species. Reference to these will show not only the distribution of the species, but also the areas which were most thoroughly covered, and this will make easier the selection of sample areas for future study. The English names used for birds in this paper are those used in *The Handbook of British Birds*.

The writer owes his thanks to the many observers who have assisted him on the monthly visits to the Common, not least for their patience in continuing the dull and exacting work of counting and mapping without the stimulus of seeing how their data were gradually building a picture, however incomplete, of the bird population.

The Diptera of Bookham Common.

By L. Parmenter, F.R.E.S.

This preliminary list forms part of the survey undertaken by the Ecological Section of 380 acres of National Trust property in Surrey adjoining Bookham.

Description of the Area.

The area consists of dense oakwood on ground which slopes from 233 feet to about 120 feet where it meets low-lying wet grassland. The latter covers and fringes an alluvial belt formed by a stream which flows across the common, leaving it at its lowest point at 98 feet above sea level. A shallow valley of ponds and damp hollows runs from east to west, separating the main woodland from outlying woodland about the bracken-covered Eastern Plain. The grassland is dominated by *Molinia* or *Deschampsia caespitosa*, both being large tuft-forming species, and short turf is found only along the narrow paths. Few animals have grazed the Common during the past 4 or 5 years.

The plains are dotted with thorns, some bramble and rose bushes, whilst wide belts of bracken occupy the higher ground. Gorse is scanty. The woods, though dominated by oaks, also contain birch, beech, hornbeam and sycamore, with much hazel, blackthorn and holly and with a ground layer of bracken and brambles. A fair variety of flowering plants occurs along the paths, rides and open areas throughout the woods and at the margins.

Ponds, and, since 1940, bomb craters, flooded gun pits and slit trenches in the open plains, in the woodland and its margins, provide a varied range of water and marsh habitats.

A number of papers and maps on the area by members of the Section have been published and so far the following groups and aspects have been studied: Topography (*L.N.*, 1942), History of the Common ('42), Vegetation of Ponds ('44), of Pits ('48), of Woods ('46), Fungi ('46, '48), Algae ('48), Birds ('43), Mollusca ('47), Dragonflies ('44), Coleoptera ('44-48), Woodlice ('47), Plant galls ('45).

These give a background or setting to the following list of the flies found in the area.

Distribution.

The number of species already known from the area is over 700, twice that recorded for the county of Surrey by E. E. Austen: *Victoria County History of Surrey*, Vol. 1, 1902, and therefore it is hoped that this paper will form a useful contribution to the county records. It includes two species not previously recorded for the British Isles:— *Palloptera neutra* Pand. and *Agromyza anthracina* Mg.

To deal adequately with the ecology of the diptera would need far more study than it has been possible to undertake. It was considered that a systematic list with notes on distribution, and especially of the time of appearance of the adult flies, and on biological habits and habitats would form a useful preliminary paper, and a basis for more intensive work on special problems by members.

Many factors governing the distribution of each species are involved and it would be impossible to keep the paper within reasonable bounds if they were dealt with adequately. It is hoped to deal with various factors in future papers from time to time.

Flies, like many other insects, depend on warmth before they can even move. They quickly become sluggish and inert with a lowering of temperature, but many seem even more responsive to the actual rays of the sun. In the summer, especially, the quick change from an abundance of a great variety of active, to a paucity of sluggish, flies with a clouding over of the sky, is so remarkable as to be noted by naturalists other than dipterists.

Most species have a short period of life as an adult, and this is devoted almost entirely to mating and oviposition. Feeding of adult flies is subservient to this dominant behaviour, and provides the requisite food essential to the production of an abundance of fertilised eggs.

In addition to this mature stage, one must remember that the greater part of the fly's life has been spent as egg, grub and pupa. Feeding in the grub or larval stage may be a more dominating factor in distribution of the adult than any other, e.g., in the plant devouring *Trypetidae*, *Agromyzidae* and *Cecidomyiidae*. Shelter must be very important in all stages of the life history. It provides the essential humidity and temperature necessary for the fly. The rapid colonisation of the herbage as spring merges into summer demonstrates the quick appreciation of the change by the many species involved.

The immature stages of flies are mostly confined to the earth, inside plants, rotting animal or vegetable material. The adult fly needs more space, using the air to acquire a mate quickly, to reach its food and to dodge its enemies. Each species has certain requirements as to space. Certain male *Syrphidae* will hover in quite tiny areas awaiting the passage of females whilst others, and such species as the Stratiomyid, *Odontomyia argentata*, hover only in wide open spaces. Males of species of *Fannia* cruise to and fro beneath trees in partial shade, falling prey to *Empis femorata*, the hunter of the partially shaded areas. The *Bibionidae* males need the open areas. Their manoeuvrability and speed in flight increase with the rise of temperature and here, in these open areas, they are captured by cruising *Rhamphomyia* and by *Empis tessellata* and birds hunting from bushes and trees.

The attraction of bracken increases with the growth of its fronds, whose canopy forms a micro-habitat with a micro-climate of a humidity and temperature of far less range than in most strata above the vegetation of ground level. Typical adult inhabitants of the bracken canopy are *Rhagio lineola*, *Musca autumnalis* and *Hybos culiciformis* in the open, and the abundant males of *Hylemya strenua* under shade; this last species is also found on most wide leaves of plants in the woodland.

Another example of the appreciation of shelter is that shown by *Trichoceridae* (Winter gnats) and certain species of *Chironomidae* when the males swarm in the lee of bushes in the light breezes at sundown.

The habit of "sunning" attracts *Larvaevoridae*, *Calliphoridae*, *Muscidae* and a few *Syrphidae* amongst others, to the tree trunks. But the boles also provide hunting posts for *Rhamphomyia*, feeding grounds for *Tachypeza*, and waiting stations for female-hunting males of such species as *Rhagio scolapacca* and *Eustalomyia histrio*.

FEEDING.

Flowers are frequented by the adults of a variety of species of several families, for nectar and for pollen. These are dealt with separately in this paper. Flies whose larvae feed internally in plants are generally restricted when adult to the immediate neighbourhood of the foodplant.

Those attracted to carrion, dung and rotting matter (vegetable and animal) owing to the scattered distribution of the habitat, are found elsewhere in their search for the breeding or nutrient medium. Again owing to the irregularity of occurrence and distribution of the habitat, most of these species can use more than one type of medium. This ability also applies to those flies breeding in fungi.

Certain breeding media are scarce. The public use of the Common has changed during the past fifteen years. Fewer animals graze, but on the other hand more visitors roam the woods and keep the paths open. Some tree thinning has changed the area, but dead wood of a size greater than twigs is very scarce and few inhabitants of rotting wood are present on the Common. The war brought a few changes: bomb craters and pits are acquisitions, and open spaces cleared beneath the trees provided a change in the woodland ground cover.

ENEMIES.

Man is of great importance, not by reason of collecting, but by causing the wholesale destruction of habitats by felling, burning, draining, etc. Birds are not very important, taking comparatively few flies. Spiders are very abundant and take a heavy toll of adult flies. Predatory insects—dragonflies, flies, wasps—account for many deaths of adult flies, and beetles and their larvae for those of fly larvae. But the chief enemies are the many parasitic hymenoptera. The study of these would be original work of great importance, especially if linked not only with the systematic studies now in progress at the British Museum (Natural History) but also with life history studies and controlled breeding experiments.

METHODS.

Collecting was done with net, tube, pillbox and pooter. Whenever possible captures were tubed and labelled with data in the field; this is important where species cannot be identified at sight. Naturally, although all parts of the Common have been visited at some time between 1935 and 1950, attention has not been equally distributed over the area nor during the seasons. Little collecting was undertaken until 1941, and there is a gap between early 1942 and mid 1946. Monthly visits have been made in every month, wet and fine, and about 5200 specimens have been brought home for identification. A number of larvae and pupae were also taken and the flies reared, but far too few to be of significance in this paper.

I am also indebted to many members and visitors who have reported habits, captures or given me odd specimens, including Miss C. E. Longfield, Col. C. J. F. Bensley, Messrs F. D. Buck, H. J. Burkill, J. Butcher, C. N. Colyer, B. A. Cooper, P. W. E. Currie, W. J. Finnigan, E. C. M. d'A. Fonseca, D. G. Hall, K. M. Guichard, C. O. Hammond, C. Garrett-Jones, A. E. Le Gros, M. Niblett, A. H. Norkett, the late L. G. Payne, R. M. Payne, G. Waller, and R. D. Weal.

A large number of specimens await identification, as I attempt this work myself rather than overload the systematists. However, it is a pleasure to acknowledge the great assistance given me by many entomologists, both past and present, who have given me reprints and named and unnamed material for comparison, and advice. Thanks to the kindness of the late Dr F. W. Edwards and of Mr H. Oldroyd and their colleagues, I have had the privilege of comparing specimens with named material at the British Museum (Natural History).

NOMENCLATURE.

I have used that of the *Check List* of G. S. Kloet and W. D. Hincks (1945), except where a revised monograph by Mr J. E. Collin dealing with a family has since appeared. These are indicated. I have included a number of synonyms to help link with previous literature.

Plants have been named for me by the botanists of the Society. English names are used for brevity except that the British Ecological Society's *Check List* is used in the " Flower Visitors " portion.

Spiders have been kindly identified by Mr A. E. Le Gros.

WORKS OF REFERENCE.

Mr J. E. Collin has recommended the publication of the list of works used by the compilers of distribution lists. I therefore record that I have used as a basis the most up-to-date keys, etc., published in this country and checked with foreign publications listed below:—

English works include Verrall's two volumes on *British Flies*, C. D. Day's *British Tachinid Flies*, J. F. Marshall's *Mosquitoes*, Edwards, Oldroyd and Smart's *British Blood-sucking Flies*, and the many papers in *Ent. Mon. Mag.*. *Ent. Record*, *Trans. R. Ent. Soc.*, *Trans. Zoo. Soc.*, *Trans. Soc. Brit. Ent*, etc., by J. E. Collin, F. W. Edwards, O. W. Richards, G. H. Verrall, etc., as listed by H. W. Andrews in his lists of *British Dipterological Literature* in the *Ent. Record*, 43, 47, 55, 61 (obtainable from H. W. Andrews, Breamore, Fordingbridge, Hants.).

Foreign works include various sections of Lindner's *Die Fliegen der Palearktischen Region*, Lundbeck's *Diptera Danica* and the various Diptera volumes in the *Faune de France* series by Parent, Seguy, etc.

SUGGESTED FURTHER WORK.

The Common provides an excellent field study station for naturalists. Its security as an open space is assured. It is well served by rail, with its own station, and by bus and nearby Green Line coach services. Yet it is not sufficiently attractive to the public to be spoilt by trampling and wanton damage. It is therefore suitable for long term work.

Although the study of diptera in this country is making steady progress and attracting the attention of more naturalists, saturation point for dipterists on the Common is unlikely to be reached for many years. Those that come in future will, it is hoped, not only add to the list of species of flies known from the Common but also extend the intensive work already inaugurated. Besides knowing what species are present, a difficult task in itself, we need to find out why they are there, and ultimately obtain complete details of their life histories and interrelations with other species of both animals and plants.

Suggestions for future work include:—A comparison of the distribution and habits of the species of the same genus on the Common. Concentration on the species attracted to a particular plant, their use of the particular micro-habitats associated with it. Breeding from all kinds of material, both living and dead, ascertaining numbers, life history stages and the inter-relations involved. As to flower visitors, we need to consider choice, and restriction, by species and by individuals, of colour, shape, scent and time of day, and whether pollen, nectar or other insect visitors are taken (e.g., possible predators of thrips). In the courtship of many species there is a particular relationship between the display and the habitat, and there is scope for interesting work here. Again certain species, e.g., *Syritta pipiens*, appear to "play" and the habitat has a function in controlling this aspect of behaviour. A number of flies are predatory, others parasitic and in the search for prey restrictions seem to be imposed by the composition of the habitat and these would form a suitable subject for investigation. All species respond to a daily rhythm as well as to a seasonal one during their life. This rhythm, we know, is modified by climatic conditions, and a study of this aspect is needed. Those students having the ability and the necessary laboratory facilities might consider undertaking work on the lines of that of Dr A. D. Hanna on *Ceratitis capitata* Wied., *Bull. Soc. Fouad. Ier Entom.*, XXXI, 251 (1947), who includes in his studies the internal anatomy and its functions as applicable to its ecology.

The pure ecologist considers himself concerned primarily with numbers. The mere recording of numbers present could be undertaken by quite inexpert visitors, but correlation with ecological factors needs time, technical ability, apparatus and training.

Studies of the micro-climates, of micro-habitats and intensive studies of, for example, the inhabitants of tufts of grass, or of dead bracken blanket, would be of interest. One has only to think of the species associated with one of the gun pits on Eastern Plain to be reminded of the *Limoniinae* of the rushes, the *Sphaeroceridae*, and species of *Stilpon*, *Elachiptera* of the grass tufts, *Metopia* and *Pollenia* of the ramparts, and *Rhamphomyia*, *Hilara*, *Campsicnemus*, *Ephydridae* and *Chironomidae* of the flood water in the pit. Mr Garrett-Jones has already made some interesting observations on the inter-relations of certain *Hilara* in these pits.

Moreover, the marking of individual flies by students able to spare consecutive days to the task, should throw some light on the dispersal of various species. In fact, the marking of a variety of easily recognised species of both diptera and other orders might be attempted by all entomologists present, and by co-operation in subsequent observations a considerable advance in our knowledge of insect dispersal be obtained.

In the past entomologists have been too prone to be satisfied by the capture of specimens, by unannotated distribution lists, and by merely noting the foodplant of an insect. There is much more of interest to be found out by those able and willing to observe more closely.

ABBREVIATIONS.

The following have been used for localities on the Common:—
Bay. = Bayfield. C. = Central. E. = East, eastern. I. of W. = Isle of Wight. K. = Kelsey's. L. = Lower. S.E. = South eastern. U. = Upper. W. = West, western.

FLOWER VISITORS.

YELLOW FLOWERS.

Agrimonia eupatoria L. Agrimony. *Phaonia basalis* (Zt.) [*Mus.*].

Hieracium umbellatum L. Umbellate Hawkweed. *Rhamphomyia longipes* (Mg.) [*Emp.*].

Hypericum perforatum L. St John's Wort. *Syrphidis vitripennis* (Mg.) [*Syr.*].

Hypochaeris radicata L. Long rooted Cat's-ear. *Rhamphomyia longipes* (Mg.) [*Emp.*].

Lapsana communis L. Nipplewort. *Melanostoma mellinum* (L.) [*Syr.*].

Lysimachia nemorum L. Yellow Pimpernel. *Platycheirus manicatus* (Mg.) [*Syr.*].

Pastinaca sativa L. Wild Parsnip. *Dilophus febrilis* (L.) [*Bib.*]. *Psectosciara soluta* (Lw.) [*Scatop.*], *Asindulum flavum* (Winn.) [*Mycet.*], *Sciara thomae* (L.), *Chloromyia formosa* (Scop.) [*Strat.*], *Dolichopus discifer* Stann. [*Dol.*], *Chrysotoxum bicinctum* (L.) [Syr.]. *Episyrphus balteatus* (Deg.), *Eristalinus sepulchralis* (L.), *Mallota cimbiciformis* (Fln.), *Metasyrphus luniger* (Mg.), *Myathropa florea* (L.), *Scaeva pyrastri* (L.), *Syritta pipiens* (L.), *Syrphidis ribesii* (L.), *S. vitripennis* (Mg.), *Tubifera arbustorum* (L.), *T. pertinax* (Scop.), *T. tenax* (L.), *Allophora hemiptera* (F.) [*Larv.*], *Eriothrix rufomaculatus* (Deg.), *Larvaevora fera* (L.), *Macquartia praefica* (Mg.), *Varichaeta consobrina* (Mg.), *V. radicum* (F.), *Calliphora vomitoria* (L.) [*Calliph.*], *Cynomya mortuorum* (L.), *Lucilia caesar* (L.), *L. sericata* (Mg.), *Nyctia halterata* (Pz.), *Pollenia rudis* (F.), *Sarcophaga subvicina* Rohd., *Graphomya maculata* (Scop.) [*Mus.*], *Mesembrina meridiana* (L.), *Morellia simplex* (Lw.), *Musca autumnalis* Deg.

Potentilla anserina L. Silverweed. *Geosargus iridatus* (Scop.) [*Strat.*], *Empis aestiva* Lw. [*Emp.*], *Hercostomus nigripennis* Fln. [*Dol.*], *Cheilosia rosarum* (F.) [*Syr.*], *C. granditarsa* (Forst.), *Chilomyia albitarsis* (Mg.), *C. fraterna* (Mg.), *Episyrphus balteatus* (Deg.), *Eristalinus sepulchralis* (L.), *Helophilus pendulus* (L.), *Syrphella albostriata* (Fln.), *Tubifera arbustorum* (L.), *T. nemorum* (L.), *T. tenax* (L.).

P. erecta (L.) Rausch. Tormentil. *Empis volucris* Mg. [*Emp.*], *Rhamphomyia longipes* (Mg.), *Hercostomus nigripennis* Fln. [*Dol.*], *Chrysotoxum bicinctum* (L.) [*Syr.*], *Eristalinus sepulchralis* (L.), *Lampetia equestris* (F.), *Melanostoma mellinum* (L.), *Syritta pipiens* (L.), *Tubifera pertinax* (Scop.).

Primula vulgaris Huds. Primrose. *Bombylius major* L. [*Bomb.*], *Platycheirus albimanus* (F.) [*Syr.*], *Rhingia macrocephala* (Harris), *Syrphidis ribesii* (L.), *S. torvus* (O.S.).

Pulicaria dysenterica (L.) Bernh. Fleabane. *Episyrphus balteatus* (Deg.) [*Syr.*], *Eristalinus sepulchralis* (L.), *Metasyrphus latifasciatus* (Mcq.), *Syritta pipiens* (L.), *Myopites blotii* Bréb. [*Try.*], *Crocuta geniculata* (Deg.) [*Larv.*], *Phaonia basalis* (Zt.) [*Mus.*].

Ranunculus ficaria L. Lesser Celandine. *Bombylius major* L. [*Bomb.*], *Chilomyia vernalis* (Fln.) [*Syr.*], *Melanostoma scalare* (F.), *Platycheirus albimanus* (F.), *Rhingia macrocephala* (Harris), *Sphaerophoria menthastri* (L.), *S. scripta* (L.), *Tubifera pertinax* (Scop.), *Hylemya nigrimana* (Mg.) [*Mus.*], *Phaonia serva* (Mg.).

R. flammula L. Lesser Spearwort. *Episyrphus auricollis* (Mg.) var. *maculicornis* (Zt.) [*Syr.*], *E. balteatus* (Deg.), *Helophilus pendulus* (L.), *Melanostoma mellinum* (L.).

R. repens L. Creeping Buttercup. *Odontomyia tigrina* (F.) [*Strat.*], *Empis volucris* Mg. [*Emp.*], *Rhamphomyia longipes* (Mg.), *Cheilosia rosarum* (F.) [*Syr.*], *Chilomyia albitarsis* (Mg.), *C. fraterna* (Mg.), *C. ruralis* (Mg.), *Chrysotoxum bicinctum* (L.), *Episyrphus balteatus* (Deg.), *Helophilus pendulus* (L.), *Melanostoma mellinum* (L.), *Metasyrphus luniger* (Mg.), *Neoascia dispar* (Mg.), *N. geniculata* (Mg.), *Platycheirus albimanus* (F.), *Sphaerophoria scripta* (L.), *Stenosyrphus lasiophthalmus* (Zt.), *Syrphella albostriata* (Fln.), *S. tricincta* (Fln.), *S. venusta* (Mg.), *Syrphidis ribesii* (L.), *Tubifera arbustorum* (L.), *T. nemorum* (L.), *T. tenax* (L.), *Zelima segnis* (L.), *Scopeuma squalidum* (Mg.) [*Cord.*], *Crocuta geniculata* (Deg.) [*Larv.*], *Phaonia serva* (Mg.) [*Mus.*],

Salix sp. Sallow. *Bombylius major* L. [*Bomb.*], *Diploneura nitidula* (Mg.) [*Phor.*], *Chilomyia corydon* (Harris) [*Syr.*], *Stenosyrphus lasiophthalmus* (Zt.), *Syritta pipiens* (L.), *Syrphidis torvus* (O.S.), *Tubifera arbustorum* (L.), *T. tenax* (L.), *Tephritis conjuncta* (Lw.) [*Tryp.*], *Sepsis cynipsea* (L.) [*Sep.*], *Madiza glabra* Fln. [*Mil.*], *Scopeuma stercorarium* (L.) [*Cord.*], *Phorocera vernalis* R.D. [*Larv.*], *Salmacia divisa* (Mg.), *Pollenia rudis* (F.) [*Callip.*], *P. vespillo* (F.), *Dasyphora cyanella* Mg. [*Mus.*], *Egle muscaria* (F.), *E. parva* R.D., *Orthellia cornicina* (F.).

Senecio aquaticus Hill. Marsh Ragwort. *Varichaeta radicum* (F.) [*Larv.*].

S. erucifolius L. Hoary Ragwort. *Episyrphus balteatus* (Deg. [*Syr.*], *Metasyrphus luniger* (Mg.), *Sphaerophoria scripta* (L.), *Tubifera arbustorum* (L.), *T. tenax* (L.).

S. jacobaea L. Ragwort. *Sphaerophoria scripta* (L.) [*Syr.*], *Tubifera arbustorum* (L.), *Crocuta geniculata* (Deg.) [*Larv.*], *Sarcophaga carnaria* (L.) [*Callip.*].

Silaum silaus (L.) Schinz & Thell. Pepper Saxifrage. *Metasyrphus luniger* (Mg.) [*Syr.*].

Sisymbrium officinale (L.) Scop. Hedge Mustard. *Platycheirus albimanus* (F.) [*Syr.*], *Rhingia macrocephala* (Harris).

Sonchus arvensis L. Corn Sowthistle. *Episyrphus balteatus* (Deg.) [*Syr.*], *Scaeva pyrastri* (L.), *Syrphidis vitripennis* (Mg.), *Tubifera arbustorum* (L.), *T. tenax* (L.), *Ensina sonchi* L. [*Tryp.*]

S. asper (L.) Hill. Rough Sowthistle. *Episyrphus balteatus* (Deg. [*Syr.*], *Eristalinus sepulchralis* (L.), *Helophilus pendulus* (L.), *Melanostoma mellinum* (L.), *Platycheirus albimanus* (F.), *Tubifera tenax* (L.).

Taraxacum officinale Weber. Dandelion. *Rhingia macrocephala* (Harris) [*Syr.*], *Sphaerophoria menthastri* (L.), *S. scripta* (L.), *Syrphidis torvus* (O.S.), *Scopeuma stercorarium* (L.) [*Cord.*].

Tussilago farfara L. Coltsfoot. *Scopeuma stercorarium* (L.) [*Cord.*].

WHITE FLOWERS.

Achillea millefolium L. Yarrow. *Tubifera arbustorum* (L.) [*Syr.*], *Pollenia rudis* (F.) [*Callip.*].

A. ptarmica L. Sneezewort. *Helophilus hybridus* Lw. [*Syr.*], *Platycheirus angustatus* (Zt.), *Tubifera arbustorum* (L.).

Alliaria petiolata (Bieg.) Cav. Grande. Garlic Mustard. *Platycheirus albimanus* (F.) [*Syr.*], *Rhingia macrocephala* (Harris).

Angellica sylvestris L. Angelica. *Syritta pipiens* (L.) [*Syr.*], *Tubifera arbustorum* (L.), *T. pertinax* (Scop.), *T. tenax* (L.), *Larvaevora fera* (L.) [*Larv.*], *Sarcophaga carnaria* (L.) [*Calliph.*], *Graphomya maculata* (Scop.) [*Mus.*]. *Musca autumnalis* Deg., *Phaonia basalis* (Zt.).

Anthriscus sylvestris (L.) Hoffm. Keck. *Tubifera pertinax* (Scop.) [*Syr.*], *Larvaevora fera* (L.) [*Larv.*].

Calystegia sepium (L.) R. Br. Large Bindweed. *Rhingia macrocephala* (Harris) [*Syr.*].

Cardamine pratensis L. Cuckoo Flower. *Melanostoma mellinum* (L.) [*Syr.*], *Platycheirus albimanus* (F.), *Rhingia macrocephala* (Harris).

Cornus sanguinea L. Dogwood. *Empis tessellata* F. [*Emp.*].

Crataegus sp. Hawthorn. *Bombylius major* L. [*Bom.*], *Empis tessellata* F. [*Emp.*], *Chilomyia carbonaria* (Egg.) [*Syr.*], *C. vernalis* (Fln.), *Epistrophe eligans* (Harris), *Episyrphus euchromus* (Kow.), *Helophilus pendulus* (L.), *Melanostoma mellinum* (L.), *M. scalare* (F.), *Metasyrphus luniger* (Mg.), *Myathropa florea* (L.), *Penthesilea asilica* (Fln.), *P. berberina* (F.), *Platycheirus albimanus* (F.), *Rhingia macrocephala* (Harris), *Sphaerophoria scripta* (L.), *Syritta pipiens* (L.), *Syrphidis nitidicollis* (Mg.), *S. ribesii* (L.), *S. torvus* (O.S.), *S. vitripennis* (Mg.), *Tubifera arbustorum* (L.), *T. intricaria* (L.), *T. nemorum* (L.), *T. pertinax* (Scop.), *T. tenax* (L.), *T. horticola* (Deg.), *Myopa buccata* (L.) [*Conop.*], *M. testacea* (L.), *Allophora hemiptera* (F.) [*Larv.*], *Ernestiarudis* (Fln.), *Larvaevora fera* (L.), *Servillia ursina* (Mg.), *Trixa caerulescens* Mg.

Filipendula ulmaria (L.) Maxim. Meadowsweet. *Tubifera arbustorum* (L.) [*Syr.*], *T. pertinax* (Scop.), *Macquartia praefica* (Mg.) [*Larv.*].

Galium palustre L. Marsh Bedstraw. *Empis volucris* Mg. [*Emp.*], *Syrphidis vitripennis* (Mg.) [*Syr.*].

G. saxatile L. Heath Bedstraw. *Lampetia equestris* (F.) [*Syr.*].

Heracleum sphondylium L. Hogweed. *Chloromyia formosa* (Scop.) [*Strat.*], *Empis livida* L. [*Emp.*], *E. lutea* Mg., *E. volucris* Mg., *Rhamphomyia longipes* (Mg.), *Chilomyia barbata* (Lw.) [*Syr.*], *C. illustrata* (Harris), *Chrysotoxum bicinctum* (L.), *Episyrphus balteatus* (Deg.), *Eristalinus sepulchralis* (L.), *Syrphidis ribesii* (L.), *Tubifera arbustorum* (L.), *T. pertinax* (Scop.), *T. tenax* (L.), *Volucella bombylans* (L.), *V. pellucens* (L.), *Scopeuma stercorarium* (L.) [*Cord.*], *Allophora hemiptera* (F.) [*Larv.*], *Hyalomyia obesa* (F.), *Rhodogyne rotundatum* (L.), *Calliphora erythrocephala* (Mg.) [*Callip.*], *Sarcophaga subvicina* Rohd., *Fannia pretiosa* (Schin.) [*Mus.*], *Mesembrina meridiana* (L.), *Phaonia basalis* (Zt.), *P. pallida* (F.), *P. scutellaris* (Fln.).

Lycopus europaeus L. Gipsywort. *Eristalinus sepulchralis* (L.) [*Syr.*], *Platycheirus angustatus* (Zt.), *Syritta pipiens* (L.), *Tubifera arbustorum* (L.), *T. nemorum* (L.).

Oxalis acetosella L. Wood Sorrel. *Bombylius major* (L.) [*Bom.*].

Prunus spinosa L. Blackthorn. *Bombylius major* L. [*Bom.*], *Empis chioptera* Mg. [*Emp.*], *Melanostoma ambiguum* (Fln.) [*Syr.*], *Metasyrphus luniger* (Mg.), *Penthesilea ranunculi* (Pz.), *Platycheirus albimanus* (F.), *Rhingia macrocephala* (Harris), *Syrphidis torvus* (O.S.), *Tubifera arbustorum* (L.), *T. intricaria* (L.), *T. pertinax* (Scop.), *Scopeuma stercorarium* (L.) [*Cord.*], *Salmacia divisa* (Mg.) [*Larv.*], *Pollenia vespillo* (F.) [*Calliph.*], *Dasyphora cyanella* Mg. [*Mus.*], *Orthellia cornicina* (F.).

Ranunculus sp. Water Crowfoot. *Eristalinus sepulchralis* (L.) [*Sir.*], *Platycheirus albimanus* (F.).

Sambucus nigra L. Elder. *Episyrphus cinctellus* (Zt.) [*Syr.*], *Volucella inflata* (F.).

Sorbus aucuparia L. Mountain Ash. *Tubifera arbustorum* (L.) [*Syr.*], *Phaonia basalis* (Zt.) [*Mus.*].

Stellaria holostea L. Greater Stitchwort. *Empis livida* L. [*Emp.*], *E. pennipes* L., *E. praevia* Collin, *E. tessellata* F., *Rhamphomyia longipes* (Mg.), *Melanostoma mellinum* (L.) [*Syr.*], *Pipiza noctiluca* (L.), *Platycheirus albimanus* (F.), *P. manicatus* (Mg.), *Sphaerophoria menthastri* (L.), *S. scripta* (L.), *Syritta pipiens* (L.), *Tubifera arbustorum* (L.), *Salmacia divisa* (Mg.) [*Larv.*].

S. media (L.) Vill. Chickweed. *Rhamphomyia longipes* (Mg.) [*Emp.*].

Torilis anthriscus (L.) Gmel. Hedge Parsley. *Conops flavipes* L. [*Conop.*], *C. quadrifasciata* Deg.

PINK OR ROSE FLOWERS.

Epilobium palustre L. Marsh Willow Herb. *Empis volucris* Mg. [*Emp.*], *Rhamphomyia longipes* (Mg.).

Geranium robertianum L. Herb Robert. *Empis aestiva* Lw. [*Emp.*], *Rhingia macrocephala* (Harris) [*Syr.*], *Phaonia basalis* (Zt.) [*Mus.*].

Lychnis flos-cuculi L. Ragged Robin. *Metasyrphus luniger* (Mg.) [*Syr.*], *Rhingia macrocephala* (Harris).

Rosa canina L. agg. Dog Rose. *Metasyrphus consisto* (Harris) [*Syr.*], *Tubifera pertinax* (Scop.).

Rubus fruticosus L. agg. Bramble. *Syrphidis vitripennis* (Mg.) [*Syr.*], *Tubifera arbustorum* (L.), *T. pertinax* (Scop.), *T. tenax* (L.), *Volucella pellucens* (L.).

Trifolium pratense L. Red Clover. *Empis livida* L. [*Emp.*].

BLUE FLOWERS.

Ajuga reptans L. Bugle. *Platycheirus albimanus* (F.) [*Syr.*], *Rhingia macrocephala* (Harris).

Centaurea nigra L. Knapweed. *Episyrphus balteatus* (Deg.) [*Syr.*].

Aster sp. Michaelmas Daisy. *Tubifera arbustorum* (L.) [*Syr.*].

Cirsium arvense (L.) Scop. Field Thistle. *Empis livida* L. [*Emp.*], *Helophilus hybridus* Lw. [*Syr*], *H. pendulus* (L.), *Tubifera arbustorum* (L.), *T. pertinax* (Scop.), *Conops quadrifasciata* Deg. [*Conop.*].

C. palustre (L.) Scop. Marsh Thistle. *Tubifera intricaria* (L.) [*Syr.*], *T. pertinax* (Scop.).

Glechoma hederacea L. Ground Ivy. *Bombylius major* L. [*Bom.*], *Helophilus pendulus* (L.) [*Syr.*], *Platycheirus albimanus* (F.), *Rhingia macrocephala* (Harris).

Mentha aquatica L. Water Mint. *Eristalinus sepulchralis* (L.) [*Syr.*], *Helophilus hybridus* Lw., *Melanostoma scalare* (F.), *Rhingia macrocephala* (Harris), *Syritta pipiens* (L.), *Syrphidis vitripennis* (Mg.), *Tubifera arbustorum* (L.), *T. horticola* (Deg.), *T. nemorum* (L.), *T. pertinax* (Scop.), *T. tenax* (L.), *Volucella inanis* (L.), *V. pellucens* (L.), *Conops flavipes* L. [*Conop.*], *Larvaevora fera* (L.) [*Larv.*], *Sarcophaga carnaria* (L.) [*Calliph.*], *Graphomya maculata* (Scop.) [*Mus*].

Myosotis scorpioides L. Forget-me-not. *Rhamphomyia longipes* (Mg.) [*Emp.*], *Cheilosia rosarum* (F.) [*Syr.*], *Platycheirus albimanus* (F.), *Phaonia basalis* (Zt.) [*Mus.*].

Prunella vulgaris L. Self-heal. *Rhingia macrocephala* (Harris) [*Syr.*].

Scilla non-scripta (L.) Hoff. & Link. Bluebell. *Bombylius major* L. [*Bom.*], *Melanostoma mellinum* (L.) [*Syr.*], *Platycheirus albimanus* (F.), *Rhingia macrocephala* (Harris).

Succisa pratensis Moench. Devil's-bit Scabious. *Cinxia silentis* (Harris) [*Syr.*], *Episyrphus balteatus* (Deg.), *Helophilus pendulus* (L.), *Melanostroma scalare* (F.), *Rhingia macrocephala* (Harris), *R. rostrata* (L.), *Syritta pipiens* (L.). *Syrphidis vitripennis* (Mg.), *Tubifera arbustorum* (L.), *T. horticola* (Deg.), *T. pertinax* (Scop.), *T. tenax* (L.), *Volucella pellucens* (L.), *Crocuta genicu-*

lata (Deg.) [*Larv.*], *Eriothrix rufomaculatus* (Deg.), *Larvaevora fera* (L.), *Pollenia rudis* (F.) [*Calliph.*], *Graphomya maculata* (Scop.) [*Mus.*], *Phaonia basalis* (Zt.).

Veronica officinalis L. Speedwell. *Sphaerophoria scripta* (L.) [*Syr.*].

Viola sp. Violet. *Rhingia macrocephala* (Harris) [*Syr.*].

From these observations it would appear that colour plays little, if any, part in restricting the choice of flower visited. The time of emergence is obviously the chief controlling factor, but it will have been noted that flies such as those of the genus *Neoascia* which cruise at a very low height above the ground visit only short-stemmed flowers. More intensive observation might show which species seek only pollen or only nectar, the degree of preference and to what extent each species of fly and each individual will keep to one species of flower or one colour. Again, only day observations have been made. It may be that dusk and night studies would produce evidence of other relationships. The competition between diptera and other orders for these " sweets " has not yet been assessed at Bookham.

FUNGUS VISITORS.—Adult flies unless otherwise stated.

Amanita muscaria (L.) Fr. *Dryomyza flaveola* (F.) var. *zawadskii* Schum.

Coprinus comatus (Fl. Dan.) Fr. *Neuroctena anilis* (Fln.).

Merulius tremellosus (Schrad.). *Mycomyia marginata* (Mg.)—larvae.

Phallus impudicus Pers. *Calliphora erythrocephala* (Mg.), *C. vomitoria* (L.). *Lucilia ampullacea* Vill., *Phaonia variegata* (Mg.), *Neuroctena anilis* (Fln.)

Pholiota spectabilis Fr. *Triphleba minuta* (F.).

Species indet., a slime fungus on oak. *Anisopus fenestralis* Scop., *A. punctatus* F., *Drosophila funebris* (F.), *D. obscura* Fln., *D. phalerata* Mg., *Neuroctena anilis* (Fln.).

Species indet., *Helomyza affinis* Mg., *H. bicolor* (Zt.), *H. notata* Mg. var. *hilaris* Zt., *H. variegata* Lw., *Hylemya strenua* R.D.

CARRION VISITORS.

Rabbit. *Calliphora erythrocephala* (Mg.), *Hydrotaea dentipes* (F.), *Lucilia caesar* (L.), *L. sericata* (Mg.), *Neoleria inscripta* (Mg.), *Piophila vulgaris* Fln., *Pseudomorellia albolineata* (Fln.).

Mole. *Calliphora erythrocephala* (Mg.), *Hydrotaea dentipes* (F.), *Neuroctena anilis* (Fln.), *Polietes lardaria* (F.), *Stratioborborus fimetarius* (Mg.).

Crow. *Hydrotaea dentipes* (F.), *Neoleria inscripta* (Mg.), *Piophila vulgaris* Fln., *Stratioborborus fimetarius* (Mg.).

Blackbird. *Calliphora erythrocephala* (Mg.).

DUNG VISITORS.

Horse. *Dasyphora cyanella* Mg., *Polietes lardaria* (F.), *Scopeuma stercorarium* (L.), *Sphaerocera curvipes* Latr., *Stratioborborus nitidus* (Mg.), *Trichiaspis equina* (Fln.), *T. similis* (Collin), *T. stercoraria* (Mg.).

Cow. *Anisopus punctatus* F. bred, *Mesembrina meridiana* (L.) ovipositing, *Morellia* sp. indet. females only, *Rhingia macrocephala* (Harris) ovipositing, *Scopeuma stercorarium* (L.).

Man. *Polietes lardaria* (F.) ovipositing, *Scopeuma stercorarium* (L.).

Dog. *Polietes lardaria* (F.).

Rabbit. *Trichiaspis similis* (Collin).

Pheasant. *Stratioborborus fimetarius* (Mg.).

SYSTEMATIC LIST.

ORTHORRHAPHA—NEMATOCERA.

TIPULIDAE—Crane flies—larvae include the leather jackets. Most larvae live in the ground, some are aquatic, others breed in decaying wood and fungi.

Ctenophora pectinicornis (L.). Female found by stream, C. plain, 24th May 1947. by P.W.E.C.

Erioptera hybrida (Mg.). Male taken 11th June 1939, det. F. W. Edwards.

Helius longirostris (Mg.). June, marshy areas about the ponds.

Limnophila dispar (Mg.). May, June, common in ditches and *Juncus* clumps in the marshes about and between the ponds.

L. ferruginea (Mg.). May, June, Aug. to Oct., common around the ponds and marshy areas, and at times found at damp areas in the woodland.

L. fulvonervosa (Schum.). June, Aug., marshy ground between the ponds and in damp woodland areas.

L. lineola (Mg.). Male found in I. of W. ditch, 15th May 1946.

Limonia bifasciata (Schr.). July, Oct., C. wood E. hollow, E. plain.

L. dumetorum Mg. June,. Sept., about U.E. pond.

L. flavipes (F.). June, marshy areas.

L. maculata (Mg.). Oct., flying under closed canopy of Oaks in S.E. wood.

L. nubeculosa Mg. May, June, Oct.. Nov., about U.E. pond and in shade areas of the woodland.

L. tripunctata (F.). July, E. wood.

Molophilus appendiculatus (Staeg.). Male, bred from mud from S.E. pond. emerged 19th Oct. (C.N.C.).

Nephrotoma analis (Schum.). Male taken by H.J.B., 29th May 1937.

N. cornicina (L.). Aug., Kelsey's wood.

N. flavescens (L.). July, Stents wood West.

N. flavipalpis (Mg.). Aug., E. plain.

N. guestfalica West. July, Bayfield plain

N. maculata (Mg.). May, June, plains and open woodland.

N. quadrifaria (Mg.). June, plains.

Ormosia lineata (Mcq.). May, in *Juncus* area about Bayfield pond.

Pedicia immaculata (Mg.). May, in *Juncus* area about I. of W. pond.

Tipula cava Riedel. June, E. plain

T. fascipennis Mg. July, E. wood.

T. flavolineata Mg. June, Aug., Sept., breeds in small rotting branches, woodland areas.

T. lateralis Mg. May, June, Aug., found on the plains and seen ovipositing in mud of stream to north of U.E. pond in May.

T. luna Westh. May, June, about the ponds and in the marshy areas between.

T. lunata L. May, June, about the ponds and damp areas in the woods, including Station Copse.

T. marmorata Mg. Sept., about U.E. pond.

T. oleracea L. May, June, Oct., in the open plains, especially about the ditches

T. pabulina Mg. May, June, woodland.

T. paludosa Mg. Aug. to Oct., often abundant, mostly in the open plains, but at times in the open areas of, and between, the woods, moving along the paths.

T. variipennis Mg. May, June, damp areas in woodland and W. hollow.

T. vernalis Mg. May, June, on the plains and in the woods.

T. vittata Mg. May, Manor pond marsh.

TRICHOCERIDAE [PETAURISTIDAE]. Winter gnats. Larvae breed in decaying vegetation. Adult males dance in swarms at dusk and other calm periods in winter.

Trichocera hiemalis (Deg.). March, Dec., about the ponds, edges of woodland and on the plains.

T. major Edw. Nov., Dec., bracken areas of E. plain and of the woodland.
T. regelationis (L.). Nov. to March, about the ponds, on plains and the open areas of woodland.
T. saltator (Harr.). Jan. to March, Nov., about the ponds, on all the plains.

ANISOPODIDAE [RHYPHIDAE].

Anisopus fenestralis Scop. Nov., found on slime fungus on Oak in. S.E. wood.
A. punctatus F. May, Oct., found in numbers on the slime fungus with above. Also seen ovipositing in fresh cow dung in woodland. and bred from cow dung found in the open near the woodland.

PTYCHOPTERIDAE [LIRIOPEIDAE]. Larvae breed in mud.

Ptychoptera albimana (F.). May, damp areas C. wood and ditch of Bay. plain.
P. contaminata (L.). May, June, Aug., about the ponds, including the shaded Sheepbell pond.
P. minuta (Tonn.). May, at margin of Sheepbell pond.

PSYCHODIDAE. Owl midges. Larvae breed in mud and decaying vegetation. Adults of some species pollinate the Wild Arum. I have not yet attempted to identify any of the species which occur; several species noted about Sheepbell pond.

CULICIDAE. Mosquitoes. Adult females " bite." Larvae breed in water.

Aedes cantans (Mg.). Larvae found in April in Sheepbell pond, females found about the same pond in May.
A. punctor Kirby. May, attacking at edge of S.E. wood (C.N.C.).
Anopheles maculipennis Mg. Oct., male on vegetation of I. of W. ditch.
Culex pipiens L. Sept., about I. of W. pond.
Dixa aestivalis Mg. Nov., adult female swept from dead *Scirpus*, U.E. pond.
Theobaldia annulata (Schr.). Nov., larvae and pupae found in I. of W. pond near bank.
T. fumipennis (Steph.). Bred by C.N.C. from larvae found in April in Bay pond, emerged in April.
T. morsitans (Theo.). Larvae found in small shaded pool in L.E. pond area.

CHIRONOMIDAE [TENDIPEDIDAE]. Non-biting midges. Larvae breed in water, mud, and some in rotting vegetation. I have not yet attempted to identify the many species occurring.

CERATOPOGONIDAE [HELEIDAE]. Biting midges. Females " bite." Larvae breed in rotting vegetation.

Culicoides obsoletus Mg. May, Oct., often too numerous, at dusk, females always attacking, particularly the face.

SIMULIIDAE [MELUSINIDAE].

Simulium ornatum Mg. March to June, Nov., about ponds. and also taken off bracken of E. plain.

BIBIONIDAE. Larvae breed in grass roots and rotting vegetation.

Bibio clavipes Mg. Sept. to Nov., males in swarms about Bay. and I. of W. ponds and on C. plain.
B. johannis (L.). April, generally found on or close to turf of the high ground about the I. of W. enclosure and I. of W. pond.

B. laniger Mg. April, May, in main ponds area.

B. lepidus Lw. Male, 12th Oct. 1947, on sallow, E. plain (C.N.C.).

B. leucopterus (Mg.). May, W. plain and the main ponds area.

B. marci (L.). May, often abundant; in favourable weather males fly quite high, drifting to and fro searching for females. At these times they have been captured by Starlings and also by Garden Warbler, and by the fly *Empis tessellata*. They rest on herbage, generally with head downwards. When climbing to the top of *Juncus* they often fall victim to spiders *Dictyna arundinacea* L. [*Dictynidae*] and also are netted by *Aranea foliata* Fourer [*Argyopidae*], on one occasion 28 males in 13 webs.

B. nigriventris Hal. May, about hawthorns of plains.

B. reticulatus Lw. May, about hawthorns of plains and on birch leaves in open woodland.

B. varipes Mg. May, on the plains and about the central ponds and marshes

B. varipes var. *hybridus* Hal. May, in E. hollow and about E. ponds.

B. venosus Mg. May, a pair found coupled on leaves of birch in ride of E. wood

Dilophus febrilis (L.). April, May, Aug., Sept., most numerous about the ponds and damp areas of the plains. Visitor to Wild Parsnip and found as prey of the spider *Dictyna arundinacea* L.

D. femoratus (Mg.). May, June, on the plains and open areas.

SCATOPSIDAE.

Aldrovandiella coxendix (Verr.). Pair coupled on Corn Sowthistle, Bay. plain, 14th Sept. 1947.

Psectosciara soluta (Lw.). Aug., male visiting flowers of Wild Parsnip, C. plain.

Scatopse notata (L.). June, Oct., Bay. plain and during these months noted indoors on the windows of Bayfield hotel.

MYCETOPHILIDAE [FUNGIVORIDAE]. Fungus gnats. Larvae breed in fungi.

Allodia crassicornis (Stan.). March, E. plain at edge of woodland.

Asindulum flavum (Winn.). June, July, a frequent visitor to umbels of Hogweed

Boletina gripha Dz. Dec., S.E. wood.

Bolitophila cinerea Mg. Dec., E. wood.

B. pseudohybrida Landr. Oct., Nov., males swept under closed canopy of Oaks. S.E. wood.

Isoneuromyia semirufa (Mg.). Sept., swept.

Leia cylindrica (Winn.). Oct., Bay. plain.

Macrocera angulata Mg. June, in woodlands.

M. fasciata Mg. Oct., in E. wood.

M. phalerata Mg. June, in S.E. wood.

M. stigma Curt. June, Oct., in E. wood and S.E. wood.

M. stigmoides Edw. June, Sept., Oct., S.E. wood.

M. vittata Mg. Oct., S.E. wood.

Mycetophila fungorum (Deg.). Oct. to Dec., numerous in the woodlands.

Mycomyia hyalinata (Mg.). Nov., E. plain.

M. marginata (Mg.). Dec., S.E. wood, and bred from fungus *Merulius tremellosus* (Schr.) growing on bark of log in a gun pit, E. plain.

M. winnertzi (Dz.). Oct., E. wood.

Phorodonta flavipes Mg. April, Oct., C. wood.

Sciara thomae (L.). Aug., a visitor to umbels of Wild Parsnip.

CECIDOMYIIDAE [ITONIDIDAE]. Gall gnats. Most of the larvae are causers of plant galls but others are predatory.

The gall makers, *Cecidomyiinae*, of this family have had the attention of Messrs H. J. Burkill and M. Niblett, and details are to be found in the papers listed in the bibliography. For the sake of space they are not repeated here.

Lestreminae occur in abundance and at least one species has been bred, from under the bark of oak stumps. No specific identifications have, however, been made.

ORTHORRHAPHA—BRACHYCERA.

STRATIOMYIIDAE. Adults visit flowers. Larvae breed in rotting vegetation or are aquatic, but some breed in earth or dung.

Beris chalybeata (Forst.). May, June, in low herbage, margin of and along open rides in woodland.

B. vallata (Forst.). June, July, on nettles and bracken of C. plain and woodlands

Chloromyia formosa (Scop.). July, Aug., visiting flowers of Wild Parsnip and Hogweed at margins of the woodland, also found on bracken edging the rides in the woods.

Geosargus bipunctatus (Scop.). Sept., female on leaves of bramble under shade area by ride in C. wood, 14th Sept. 1947.

G. iridatus (Scop.). June, visiting flowers of Silverweed.

Microchrysa flavicornis (Mg.). June, on bracken.

M. polita (L.). May, June, Aug., on bracken and leaves of birch and generally distributed.

Odontomyia argentata (F.). April, May, males hover over the marshy areas of Bay. plain by the stream and areas about Bay. and Manor ponds at a height of 4-8 feet. Females visiting the mud exposed in these areas.

O. tigrina (F.). June, visiting Buttercup flowers of the hollows and found as prey of the spider *Misumena calycina* L. [*Thomisidae*].

O. viridula (F.). Taken in E. hollow, 13th July 1947 (C.O.H.).

Pachygaster atra (Pz.). July, on leaves of trees, Stents wood West.

Stratiomys furcata (F.). Female taken on 27th July 1947 by C.O.H., by the dam of I. of W. pond (C.N.C.).

RHAGIONIDAE [LEPTIDAE]. Larvae breed in damp soil and are carnivorous.

Chrysopilus aureus (Mg.). July, swept in E. wood.

C. cristatus (F.). June, July, very numerous about ditches of the plains and especially in E. and W. hollows.

Rhagio lineola F. July, Aug., only found on bracken, but both on plains and in the woods.

R. scolopacea (L.). May to July, females mostly about the ditches of the plains, and males mostly on the trunks of oaks in and about the woods. Both sexes found as prey of male *Empis tessellata*.

R. tringaria (L.). June to Aug., generally on bracken, both of plains and woods.

TABANIDAE. Horse flies and Clegs. Adult females " bite." Larvae breed in damp soil and are carnivorous.

Chrysops caecutiens (L.). July, Aug., about I. of W. pond and in E. and W hollows. Both typical and *obsolescens* Goffe forms occur.

C. quadratus Mg. July, C. wood.

Haematopota crassicornis Whlbg. H.J.B. records this species, *L.N.*, 1943, p. 10, but I have not found it myself.

H. pluvialis (L.). June to Sept., females often attacking, confined to open ground. Males generally taken from off low herbage.

Tabanus bisignatus Jaen. May to July, females often flying at one's legs and mostly in the woods. At times appear to follow cattle when driven through the woods.

T. bromius L. June, July, occurring in open areas and in the rides of the woods.

T. glaucopsis Mg. One female taken resting on bracken of C. plain, 11th Aug. 1946

T maculicornis Zt. H.J.B. records this species, *L.N.*, 1943, p. 10, but I have not seen a specimen from the Common myself.

CYRTIDAE [ACROCERIDAE]. Parasitic on spiders.

Acrocera globulus Pz. July, taken off bracken of E. plain in 1947 and by P.W.E.C. on *Salix* in area 733 in 1948.

Oncodes pallipes Latr. July, Aug., taken off bracken in E. plain in 1947, and by P.W.E.C. on leaf of a Crab Apple tree, C. plain in 1946.

BOMBYLIIDAE. Bee flies. Adults are flower visitors, mimic bees, and the larvae live in the nests of bees and wasps.

Bombylius major L. March to June, well distributed, males will hover up to 15 feet above ground. Visited flowers of Blackthorn, Bluebell, Ground Ivy, Hawthorn, Lesser Celandine, Primrose, Sallow, and Wood Sorrel.

THEREVIDAE. Larvae and adults are said to be carnivorous.

Thereva plebeja L. Female found on short turf in glade of Station Copse, 15th May 1946.

ASILIDAE. Robber flies. Larvae live in the earth. Adults are predatory on other insects.

Dioctria atricapilla Mg. June, hunts in long grass about S.E. wood.

D. baumhaueri Mg. June, July, hunting in the herbage of the open parts of the wood.

D. linearis (F.). June, July, swept from the low herbage in the woods.

D. oelandica (L.). June, Sheepbell wood.

D. rufipes (Deg.). June, Sheepbell wood.

Laphria marginata (L.). June to Aug., hunting from bracken, and at times from brambles and other herbage, mostly in the open rides in the wood land, E. and W. hollows, but also found on C. plain.

Leptogaster cylindrica (Deg.). June, July, hunting in the long grass of the open plains and E. hollow.

Neoitamus cyanurus (Lw.). A pair taken coupled on bracken, C. wood, 16th June 1946, by P.W.E.C.

EMPIDIDAE. Larvae live in the earth and, like the adults, are carnivorous. The flies also visit flowers for nectar.

Bicellaria intermedia Lund. June, Sheepbell wood.

B. pilosa Lund. June, off bracken, S.E. wood.

B. sulcata (Zt.). May, June, Sept., well distributed about the ponds and marshy areas of the woodlands, and also found by the I. of W. ditch and on Bay. plain.

Clinocera stagnalis (Hal.). May, June, C. plain.

Dolichocephala guttata (Hal.). A female taken at the pothole by pit E., E. plain, 11th May 1947 (C.G.-J.).

D. irrorata (Fln.). June, Aug., at pothole as above, by I. of W. ditch and near Hundred pound bridge (C.G.-J.).

Empis albinervis Mg. Aug., C. wood.

E. aestiva Lw. June, July, visiting flowers of Herb Robert in E. wood and those of Silverweed by Station Copse.

E. caudatula Lw. Female taken on umbel of Hogweed, C. plain, on 13th July 1947 (C.N.C.).

E. chioptera Mg. April to June, on W. plain, I. of W. ditch, and also in the woodlands.

E. grisea Fln. Female taken by U.E. pond, 13th July 1947.

E. livida L. May to July, well distributed over the open plains, the hollows and in the woods. Flowerheads visited for nectar :—Greater Stitchwort, Hogweed, Red Clover, Field Thistle, Marsh Thistle.

E. lutea Mg. July, sucking Hogweed at edge of U.E. pond.

E. nuntia Mg. May, at margin of Kelsey pond.

E pennaria Fln. May, resting on leaves of birch in E. wood.

E. pennipes L. May, June, a woodland species, visiting Greater Stitchwort flowers.

E praevia Collin. June, another woodland species, sucking flowers of Greater Stitchwort.

E. scutellata Curt. June, about C. plain ditch.

E. tessellata F. May, June, well distributed both in open and woodland areas. Seen sucking Dogwood flowers but mostly those of Hawthorn, and on one occasion Greater Stitchwort. Prey noted included the flies *Bibio marci*, *Phorocera vernalis*, *Phryno vetula*, *Rhagio scolopacea*, *Rhingia macrocephala*, and *Rhamphomyia* sp. indet.

E. trigramma Mg. May, June, in woods and in the marshy areas on the plains.

E. volucris Mg. July, Aug., along the rides of the woodland and in the marshy area from I. of W. pond to E. hollow at least. Flowers visited included Buttercup, Hogweed, Marsh Bedstraw, Marsh Willowherb, and Tormentil.

Heleodromia immaculata Hal. May, June, Aug., a few males at pothole by pit E. on E. plain, and at I. of W. ditch of C. plain (C.G.-J.).

Hilara. Mr C. Garrett-Jones has paid special attention to this genus and the following records are mostly his.

H. anglodanica Lund. June, Aug., common by pit E., E. plain, noted at Bay. pond and K. pond. Leafhopper and acalyptrate fly found as prey (C.G.-J.).

H. chorica (Fln.). Aug., taken by *H. manicata* at C. ditch (C.G.-J.).

H. cornicula Lw. June, common at gun pits on E. plain, also at Bay. pond Captured by both *H. quadrivittata* Mg. and *H. interstincta* (Fln.) (C.G.-J.).

H. fuscipes (F.). June at Bay. pond (C.G.-J.).

H. interstincta (Fln.). May to Aug., common at gun pits on E. plain, also found at Bay. pond, at path puddles in C. wood and between the main ponds. Prey :—*H. corniculata* Lw., *H. manicata* Mg., *H. pilosa* Zt., and *H. quadrivittata* Mg. (C.G.-J.).

H. lurida (Fl.). A single male on the side of a tree in deep shadow at K. pond, 10th Aug. 1947 (C.G.-J.).

H. manicata Mg. Aug., numerous over pools and the ditch of C. plain and at K. pond, chasing midges and capturing *H. chorica* (Fln.), and themselves falling to the clutches of *H. interstincta* (C.G.-J.).

H. maura (Fa.). Several males taken on 25th May 1941.

H. monedula Collin. Male at K. pond, 10th Aug. 1947 (C.G.-J.).

H nigrina (Fln.). Male at K. pond, 10th Aug. 1947 (C.G.-J.).

H. pilosa Zt. May, common at the gun pits on E. plain and at the pools, ponds and throughout the clearings and rides of the woods. C.G.-J. reports this species as prey of *H. interstincta* and as captor of *Chironomidae*, *Acalyptratae* and *H. pilosa*.

H. quadrivittata Mg. At Bay. pond and capturing *H. cornicula* (C.G.-J.).

Hybos culiciformis (F.). July to Sept., found on bracken on all plains and also in the woods.

H. femoratus (Muel.). July to Aug., found in both woodland and plains.

Microphorus holosericeus (Mg.). May, along ditch of the I. of W. plain and in the woods.

Ocydromyia glabricula (Fln.). May, July, E. wood and K. pond clearing.

Oedalia flavipes Zt. Male taken on 9th June 1946.

O. holmgreni Zt. May, June, S.E. wood, about the pond and in Sheepbell wood.

Phyllodromia melanocephala (F.) June, July, off bracken E. plain and C. wood.

Platypalpus agilis (Mg.). May, on hawthorn leaves on the plains, but also swept from ditches, I. of W. plain and about Sheepbell pond.

P. longicornis (Mg.). A female taken on bracken, E. plain, 9th Nov. 1947.

Rhamphomyia anomalipennis Mg. May, on leaves of crab apple, E. plain, also taken in Hill House wood and S.E. wood.

R. atra Mg. May, in E. and W. hollows.

R. barbata (Macq.). Female taken on 9th June 1935.

R. erythrophthalma Mg. Both sexes found in C. wood on 10th Oct. 1948.

R. longipes (Mg.). June, July, numerous and well distributed on all plains, and along the woodland rides. Seen taking nectar of flowers of Buttercup, Chickweed, Greater Stitchwort, Forget-me-not, Hawkweed, Cat's-ear, Hogweed, Marsh Willowherb, and Tormentil.

R. nigripennis (F.). June, E. plain and about I. of W. pond margin.

R. nigripes (F.). May, E. plain (C.G.-J.), Hill House wood and C. wood.

R. stigmosa Macq. May, between I. of W. pond and U.E. pond.

R subcinerascens Collin. April, May, male seen flying, almost hovering, by the high patch of Blackthorn, "the Clump" 819, on C. plain, and female found at margin of K. pond.

R. sulcata (Mg.). May, on hawthorn leaves, K. pond clearing, male over Manor pond marsh and female found resting on trunk of oak tree, four feet from the ground in Hill House wood.

R. tarsata Mg. May, on hedgerow herbage of Bay. plain.

R. tibiella Zt. May and June.

Stilpon graminum (Fln.). Jan., Feb., found at the foot of grass tufts about gun pits, E. plain, and at the edge of I. of W. pond.

Tachypeza nubila (Mg.). June, July, Oct., on trunks of oaks throughout the woodland area.

DOLICHOPODIDAE. Carnivorous larvae living mostly in damp earth, some in rotten wood. Adults, mostly metallic green, are predaceous on small insects.

Argyra diaphana (F.). May to July, along the woodland rides, but also on the mud of the I. of W. ditch.

A. leucocephala (Mg.). July to Oct., along the woodland rides and in W. hollow.

Campsicnemus curvipes (Fln.). Feb., March, June to Dec., found on most pools and puddles and in damp places all over the Common, both plains and woods.

C. loripes (Hal.). A male taken by C.N.C. on 8th Feb. 1948, W. hollow.

C. scambus (Fln.). Feb., March, May, June, Sept. to Nov., found in similar places as *C. curvipes* all over the Common.

Chrysotus blepharosceles Kow. June, July, on bracken of C. plain.

C. cupreus Macq. June, on bracken in Sheepbell wood.

C. gramineus (Fln.). June to Aug., on bracken of both plains and woods.

C. laesus (Wied.). June, July, on bracken of C. plain.

C. neglectus (Wied.). June, July, on bracken of E. wood.

Diaphorus oculatus (Fln.). June, July, on bracken of C. plain and E. wood.

Dolichopus arbustorum Stann. July, in E. wood.

D. claviger Stann. July, in E. wood.

D. discifer Stann. Aug., visiting flowers of Wild Parsnip, C. plain.

D. festivus Hall. July to Sept., found on C. plain and in the Hollows, about the E. ponds, and in the woods.

D. griseipennis Stann. July to Sept., on nettles and herbage in the woods and about I. of W. pond.

D. latilimbatus Macq. June, Aug., Sept., in I. of W. marsh.

D. nubilus Mg. Oct., in W. hollow.

D. pennatus Mg. June, in the woods.

D. plumipes Scop. June to Sept., both on the plains and in the woods.

D. trivialis Hal. June to Aug., in woods and about I. of W. pond.

D. ungulatus (L.). June, July, common and well distributed about the ponds and in the woods. Male seen with Chironomid larva as prey.

D. wahlbergi Zt. June, July, Sept., in the woodland areas.

Gymnopternus aerosus (Fln.). June to Aug., in the woods, about the ponds and on C. plain.

G. brevicornis (Staeg.). July, in E. wood.

G. cupreus (Fln.). June, in the woods.

G. metallicus (Stann.). June, damp areas in the woods.

Hercostomus nigripennis Fln. July, Aug., well distributed over the plains and in the woods. Visiting flowers of Silverweed and Tormentil; over 1000 counted at this latter flower on 24th July 1946.

H. parvilamellatus (Macq.). May, June, on vegetation of I. of W. ditch.

Hydrophorus litoreus Fln. March, on surface of stream, Bay. plain.

Hypophyllus obscurellus (Fln.). July, Aug., in the woods.

Neurogona quadrifasciata (F.). June, often on the trunks of birches and small oaks when coupled, but confined to the neighbourhood of Sheepbell pond, both in 1939 and 1946.

Poecilobothrus nobilitatus (L.). June, July, about I. of W. pond and in E. wood.

Porphyrops crassipes Mg. June, in C. wood.

P. fascipes Mg. May, on leaves of oaks, E. wood.

Sciopus platypterus (F.). June, on bramble leaf in C. wood.

Syntormon denticulatus (Zt.). March, at streamside, C. plain.

Xiphandrium appendiculatum (Zt.) of Verrall. Male swept from *Juncus* by the ditch, I. of W. plain, on 14th May 1942.

X. caliginosum Zt. of Verrall. May, July, ditch and marsh of I. of W. plain, I. of W. pond margin and in E. wood.

LONCHOPTERIDAE [MUSCIDORIDAE]. Larvae live in rotting vegetable matter.

Lonchoptera furcata (Fln.) form *furcata*. Edge of Sheepbell pond in April, Sept.; form *rivalis* Mg., Oct., I. of W. ditch and in W. hollow; form *cinerella* Zt., well distributed over both plains and woods.

L. lutea Pz. Feb., April, May, Sept. to Dec., the forms *cinerea* DeMeij., *flavicauda* Mg., *palustris* Mg., and *trilineata* Zt. occur, but all are well distributed over the plains, about the ponds, and in the woods and during the year.

L. scutellata Stein. A male swept from dead *Scirpus* of U.E. pond on 9th Nov. 1947, and C.N.C. reports a female from W. hollow off reeds on 8th Nov. 1948.

PHORIDAE. Some have been bred from dead *Hymenoptera*, etc., and other larvae live in rotting vegetable matter. I am indebted to Mr C. N. Colyer for the identification of my specimens of this family, as well as for the details of his own collecting.

Aneurina thoracica (Mg.). Oct., on Bay. plain.

A. unispinosa (Zt.). Oct., in E. wood.

Conicera atra Mg. March, Nov., at foot of an oak, E. plain; swept from damp area at edge of U.E pond; swept off shaded herbage in S.E. wood.

Diploneura florea (F.). April, swept from grass tufts, E. plain (C.N.C.).

D. nitidula (Mg.). April, Oct., at foot of an oak in S.E. wood, and visiting Sallow blossom at K. pond, also found on Bay. plain.

Gymnophora acuta (Mg.). June, swept.

G. quartomollis Schmitz. June, Manor House marsh and in Sheepbell wood.

Megaselia albicans (Wood). April, swept from dead bracken, path through wood N. of E. hollow (C.N.C.).

M. albidohalteris (Felt). Oct., on Bay. plain.

M. basispinata (Lund.). Oct., on Bay. plain.

M. bovista (Gimm.). Oct., on Bay. plain.

M. ciliata (Zett.). Oct., on Bay. plain.

M. halterata (Wood). Oct., males of light form on Bay. plain; females of dark form found on window of Bayfield Hotel.

M. longicostalis (Wood) Feb., found by A. E. Le Gros under tuft of grass, W hollow (C.N.C.).

M. mallochi (Wood). Found with *M. albicans* in April as above (C.N.C.).

M. pulicaria (Fln.). April, swept from dead bracken edging the path through wood N. of E. hollow (C.N.C.).

M. pygmaea (Zt.). Oct., on Bay. plain.

M. rufipes (Mg.). April, swept from waterside vegetation, I. of W. pond (C.N.C.).

M. stichata (Lund.). Oct., on Bay. plain.

M. vernalis (Wood). March, resting on telegraph pole of Mark Oak path.

M. tumida (Wood). Sept., Nov., swept off bracken in central path of C. wood.

Triphleba minuta (F.). Four females taken on the fungus *Pholiota spectabilis* Fr. [det Miss E. M. Wakefield] on E. plain, on 5th Oct. 1947.

CYCLORRHAPHA—ASCHIZA.

DORILAIDAE [PIPUNCULIDAE]. Larvae are internal parasites of Froghoppers, *Homoptera*.

Chalarus spurius (Fln.). Aug., Kelseys wood.

Dorilas [Pipunculus] ater (Mg.) = *campestris* Verr. May, June, Aug., Sept., well distributed on plains and also taken in Station copse and C. wood.

D. distinctus (Beck.). A male taken on 11th June 1939 was determined by Mr J. E. Collin, and is now in his collection.

D haemorrhoidalis (Zt.). May, Bay. plain and W. hollow.

D. strobli (Verr.). Two males were taken on 1st Sept. 1935 [det. J. E. Collin].

D. terminalis (Thom.). June, Oct., E. wood, E. and C. plains.

D. varipes (Mg.). Mr C. N. Colyer reports taking a male on 13th July 1947 hovering between grass stems near nest of the ant *Lasius flavus*, E. hollow.

D. zonatus (Zt.). July, in Stents wood West.

D. sp. Mr J. E. Collin informs me that a specimen taken on 16th June 1946 belongs to an undescribed species.

Verrallia setosa Verr. May, Hill House wood and Stents wood West.

SYRPHIDAE. Many larvae are predatory on *Aphididae*, etc., others are internal plant feeders, some live in mud, in dung, and in rotting wood. Others are commensals in the nests of the social *Hymenoptera*. Adults are mostly visitors to flowers.

Anasimyia [Helophilus] transfuga (L.). June, Aug., I. of W. marsh.

Baccha obscuripennis Mg. May, Sept., Bay. plain and K. pond clearing.

Brachyopa scutellaris R.D. June, Bay. plain.

Cartosyrphus [Chilosia] nasatulus (Beck.). June, about I. of W. pond.

C. scutellatus (Fln.). July, Sept., E. hollow and E. wood.

Cheilosia [Pyrophaena] granditarsa (Forster). June, Aug., E. plain and L.E pond. Seen visiting flowers of Silverweed.

C. rosarum (F.). May to Sept., much commoner than the last and found in damp areas on the plains, about the ponds and in the woods. Visited flowers of Buttercup, Forget-me-not and Silverweed.

Chilomyia [Chilosia] albipila (Mg.). Mr C. O. Hammond reports one on 13th April 1947 on sallow, E. hollow.

C. albitarsis (Mg.). May, June, mostly on the area between I. of W. pond and U.E. Pond. Chiefly visited Buttercup flowers but also those of Silverweed.

C. barbata (Lw.). July, about I of W. pond, visited umbel of Hogweed, and C. N. Colyer found it on the same plant, W. hollow.

C. carbonaria (Egg.). May, Aug., I. of W. marsh and Stents wood West, visiting Hawthorn flowers.

C. corydon (Harris) [=*grossa* Fln.]. March, April, C. clearing, C. and E. plains and about I of W. pond. A regular visitor to Sallow bloom.

C. fraterna (Mg.). May, June, Aug., distributed over the plains and in the woodland.

C. funebres (Harris) [=*variabilis* Pz.]. Male taken in Station Copse on 15th May 1946.

C. honesta (Rond.). Male found on leaves of Hazel in Sheepbell wood on 14th May 1942.

C. illustrata (Harris). July, visited umbels of Hogweed of C. plain, margin of U.E. pond and E. wood.

C. nebulosa (Verr.). Male taken on 14th April 1946 by L.E. pond (C.N.C.).

C. ruralis (Mg.) [=*praecox* Zt.]. April, May, S.E. wood and W. plain. Visited Buttercup flowers.

C. proxima (Zt.). May, C. clearing resting on grass.

C. vernalis (Fln.). May, on plains and open parts of the woods. Visited Hawthorn and Lesser Celandine flowers.

C. vulpina (Mg.). Aug., I. of W. marsh.

Chrysogaster hirtella Lw. May, June, about I. of W. ditch.

C. solstitialis (Fln.). July, E. wood.

Chrysotoxum bicinctum (L.). June to Aug., mostly on C. plain, but also about I. of W. pond and in E. wood. Visited flowers of Buttercup, Hogweed, Wild Parsnip, and Tormentil.

C. cautum (Harris). May, Kelseys wood.

C. festivum (L.). June, July, E. hollow.

C. latilimbatum Collin. C.O.H. reports one by L.E. pond on 12th June 1948.

Cinxia silentis (Harris) [=*Sericomyia borealis* Fln.]. Sept., one visited Devil's-bit Scabious flowers, 19th Sept. 1941.

Epistrophe [*Syrphus*] *diaphana* (Zt.). Male taken on 26th Aug. 1934, now in National Colln. at South Kensington. Another, taken by C.O.H., on 13th July 1947.

E. eligans (Harris) [=*bifasciatus* F.]. May, June, males hovering about low trees such as birch, small oaks, hawthorns, sallow, and females generally found resting on the leaves of these trees, mostly in the open areas of the woodland and about shrubs of the plains.

Episyrphus [*Syrphus*] *auricollis* (Mg.). May, male resting on leaf of beech, Sheepbell wood.

E. auricollis var. *maculicornis* (Zt.). Aug., visited Lesser Spearwort flower on C plain.

E. balteatus (Deg.). Feb., March, June to Oct., well distributed over the plains and in the woods. Visited, amongst others, flowers of Buttercup, Devil's-bit Scabious, Fleabane, Hogweed, Hoary Ragwort, Knapweed, Lesser Spearwort, Sowthistles and Wild Parsnip. Fell prey to *Scopeuma stercorarium*.

E. cinctellus (Zt.). June, Station copse and Sheepbell wood. Visited flowers of Elderberry.

E. cinctus (Fln.). June, Central wood.

E. euchromus (Kow.). May, W. plain, visited flowers of Hawthorn.

Eristalinus [*Eristalis*] *sepulchralis* (L.). April to Sept., C. and E. plains, about I. of W. pond, U.E. pond and at edge of S.E. wood. Visited flowers of Buttercup, Fleabane, Gipsywort, Hogweed, Silverweed, Sowthistle, Tormentil, Water Mint, Water Crowfoot. From a pupa found in the ice by Col Bensley, a male emerged on 25th April.

Ferdinandea [*Chrysochlamys*] *cuprea* (Scop.). June, resting on the trunk of an oak.

Helophilus hybridus Lw. May, Aug., Sept., distributed over the plains and also seen in E. hollow. Visited flowers of Field Thistle, Sneezewort, and Water Mint.

H. pendulus (L.). May to Oct., chiefly in the open areas but at times found in the woods. Females found at mud of the ponds margins and puddles in the woods. Visited flowers of Devil's-bit Scabious (especially favoured in Sept.), Buttercup, Ground Ivy, Hawthorn, Lesser Spearwort, Sowthistle, Silverweed, and Field Thistle.

Lampetia [*Merodon*] *equestris* (F.) var. *equestris* (F.). May, June, E. woodland, C. and W. plains. Males often resting on short turf of the paths. Visited flowers of Heath Bedstraw and Tormentil.

Var. *narcissi* (F.). A pair taken in June by P.W.E.C., and a female in May by C.N.C.

Var. *transversalis* (Mg.). In June, on herbage of I. of W. ditch.

Mallota cimbiciformis (Fln.). A female visited Wild Parsnip umbel by I. of W pond on 11th Aug. 1946.

Melanostoma ambiguum (Fln.). April, May, males visited the Blackthorn flowers at "The Clump" on C. plain, and males were seen hovering about Hawthorns of that plain.

M. mellinum (L.). April to Sept., numerous and well distributed all over the area. Flowers visited include Buttercup, Bluebell, Cuckoo Flower, Greater Stitchwort, Hawthorn, Lesser Spearwort, Nipplewort, Tormentil, and Rough Sowthistle.

M. scalare (F.). April to Oct., as numerous and as well distributed as *mellinum* Flowers visited include Water Mint, Devil's-bit Scabious, Hawthorn, and Lesser Celandine.

Metasyrphus consisto (Harris) [*Syrphus corollae* F.]. April, June, July, numerous and well distributed over the area. Visited Dog Rose flowers, and has been seen sucking honey dew on bracken under the oaks.

M. latifasciatus (Mcq.). April, May, Aug., found both on the plains and in the woods. Visited Fleabane flowers.

M. luniger (Mg.). April to Sept., numerous and well distributed over the whole area. Visited flowers of Hawthorn, Blackthorn, Hoary Ragwort, Pepper Saxifrage, Wild Parsnip, Ragged Robin.

M. nitens (Zt.). May, June, found about shrubs of W. scrub.

Microdon mutabilis (L.). A pair taken by the I. of W. pond on 29th May 1949 by P.W.E.C.

Myathropa [*Myiatropa*] *florea* (L.). May to Sept., found on the plains and in the woods. Visited flowers of Hawthorn and Wild Parsnip.

Neoascia dispar (Mg.). May, July, E. plain and at margin of I. of W. pond Visited flower of Buttercup.

N. geniculata (Mg.). May, a visitor to Buttercup flowers.

N. podagrica (F.). Sept., found in *Equisetum* area of the dried up I. of W pond (1947).

Neocnemodon vitripennis (Mg.). May, Bay. plain.

Paragopsis [*Eumerus*] *tuberculatus* (Rond.). Sept., at the margin of the woodland.

Penthesilea [*Criorhina*] *asilica* (Fln.). June, visitor to Hawthorn flowers.

P. berberina (F.). May, June, visitor to Hawthorn flowers, E. wood.

P. ranunculi (Pz.). April, visitor to Blackthorn flowers C., E. and Kelseys woods.

Phalangus [*Pipizella*] *virens* (F.). July, visitor to Forget-me-not, W. hollow, C.N.C.

Pipiza noctiluca (L.). May, visitor to flower of Greater Stitchwort, I. of W. plain.

Platycheirus albimanus (F.). April to Sept., very numerous and well distributed over the whole area. Flowers visited include Bugle, Buttercup, Bluebell, Blackthorn, Cuckoo Flower, Ground Ivy, Greater Stitchwort, Hawthorn, Lesser Celandine, Primrose, Forget-me-not, Sowthistle, Hedge Mustard, Garlic Mustard, Water Crowfoot.

P. angustatus (Zt.). Aug., Sept., about I. of W. pond, on E. plain. Visited Gipsywort and Sneezewort flowers.

P. clypeatus (Mg.). May, July to Sept., E. plain, W. scrub, about I. of W. and K. ponds.

P. discimanus Lw. April, in Stents wood.

P. manicatus (Mg.). May, Sheepbell wood. Visitor to flowers of Greater Stitchwort and Yellow Pimpernel.

P. timeo (Harris) [=*peltatus* Mg.]. June, on bracken.

Rhingia macrocephala (Harris) [=*campestris* Mg.]. April to Sept., two broods, linked by odd individuals in some years. Generally common and well distributed in woodland and in sheltered areas about shrubs and hedges. In 1948, only one specimen seen, on 12th Sept. The female has been seen ovipositing in cow dung (Hill House wood), but in view of the rareness of this microhabitat on the Common, the species must be regarded as visiting the Common chiefly for mating and feeding at the flowers. Visitor to Blackthorn, Bluebell, Bugle, Bindweed, Cuckoo Flower, Dandelion, Ground Ivy, Hawthorn, Garlic Mustard, Hedge Mustard, Lesser Celandine, Primrose, Ragged Robin, Selfheal, Violet, and Water Mint. Prey of *Empis tessellata* (P.W.E.C.).

R. rostrata (L.). A female was taken visiting Devil's-bit Scabious of the path in S.E. wood on 29th Sept. 1946.

Scaeva [*Catabomba*] *pyrastri* (L.). July, Aug., and a male on 9th Nov. 1947. Generally, including var. *unicolor*, on the umbels of Wild Parsnip, but also visited Corn Sowthistle on C. plain and about I. of W. pond.

S. selenitica (Mg.). A female was taken by P. Butcher on 9th June 1946.

Sphaerophoria menthastri (L.). May, June, a visitor to flowers of Dandelion, Lesser Celandine and Greater Stitchwort on Bay. plain.

S. rüppellii Wied. [=*flavicauda* Zt.]. A male taken about U.E. pond on 1st Sept. 1935.

S. scripta (L.). May to Sept. Mostly in the plains and open areas, but sometimes in the open parts of the woods. Visited flowers of Buttercup, Dandelion, Greater Stitchwort, Hawthorn, Lesser Celandine, Ragwort, and Speedwell.

Stenosyrphus [*Syrphus*] *compositarum* (Verr.). C.N.C. reports a female on 11th May 1947 flying round lower branches of ash near I. of W. cottages.

S. lasiopthalmus (Zt.). March, April, June, males seen hovering under the oaks in E. and Sheepbell woods, but also found visiting Sallow bloom at K. pond and females noted at Manor House marsh visiting Buttercup flowers.

Syritta pipiens (L.). April to Sept. Common and well distributed in open areas. I have no record of this species inside the wood. Visited flowers of Angelica, Devil's-bit Scabious, Gipsywort, Greater Stitchwort, Hawthorn, Tormentil, Wild Parsnip, Water Mint, and Sallow.

Syrphella [*Syrphus*] *albostriata* (Fln.). May, June, noted from the plains as visitor to Buttercup and Silverweed flowers. Rests on the leaves of shrubs.

S. tricincta (Fln.). May, June, Aug., found on the plains and the marshy W. hollow, as visitor to Buttercup flowers.

S. venusta (Mg.). May, June, in woods and in W. hollow, mostly resting on the leaves of shrubs and low trees, but also visited flowers of Buttercup and Hawthorn.

Syrphidis [*Syrphus*] *nitidicollis* (Mg.). May, June, on the plains and in the woods, but only noted on the western and north-western sides. Found resting on the leaves of hazel and low birch, but also visited flowers of Hawthorn.

S. ribesii (L.). May to Oct., common and well distributed throughout the area. Visited flowers of Buttercup, Hawthorn, Hogweed, Primrose, and Wild Parsnip.

S. torvus (O.S.). March to July, found all over the area. Visited flowers of Sallow. Primrose, Hawthorn, Dandelion and Blackthorn.

S. vitripennis (Mg.). March to Oct., mostly in the open areas, but also along the paths in the woodland. Visitor to Bramble, Devil's-bit Scabious, Hawthorn, St John's Wort, and Wild Parsnip.

Syrphus [*Leucozona*] *lucorum* (L.). May, June, along the margin of the woodland paths and open woodland areas. Rested on bracken, bramble, and the lower leaves of trees.

Sulcatella [*Liogaster*] *metallina* (F.). May, June, Bay. plain and Station copse.

Tubifera [*Eristalis*] *arbustorum* (L.). April to Oct., very common and well distributed over the plains, about ponds and the open areas of the woods. Flowers visited :—Angelica, Blackthorn, Bramble, Buttercup, Devil's-bit Scabious, Field Thistle, Hogweed, Meadowsweet, Michaelmas Daisy, Mountain Ash, Ragwort, Sallow, Sowthistle, Sneezewort, Gipsywort, Greater Stitchwort, Hawthorn, Silverweed ,and Water Mint. Prey of the harvestman, *Liobunum rotundum* Latr. [*Opiliones*].

T. horticola (Deg.). May, June, Aug., Sept., distributed over the whole area. Visited flowers of Devil's-bit Scabious, Hawthorn, and Water Mint.

T. intricaria (L.). April to Sept., in open areas only, visitor to flowers of Blackthorn, Devil's-bit Scabious, and Marsh Thistle.

T. nemorum (L.). May to Sept., distributed over the whole area where sufficiently open. Visitor to Buttercup, Gipsywort, Hawthorn, Silverweed, and Water Mint flowers.

T. pertinax (Scop.). March to Oct., very common and well distributed over the whole area where sufficiently open. Visitor to flowers of Angelica, Blackthorn, Bramble, Devil's-bit Scabious, Dog Rose, Hawthorn, Hogweed, Marsh

Thistle, Meadowsweet, Keck, Lesser Celandine, Tormentil, Water Mint, and Wild Parsnip.

T. tenax (L.). April to Oct., very common and well distributed over the whole area where sufficiently open. Visitor to flowers of Angelica, Buttercup, Bramble, Devil's-bit Scabious, Hawthorn, Hogweed, Ragwort, Sowthistle. Water Mint, Wild Parsnip, Sallow, and Silverweed.

Volucella bombylans (L.). Both forms *bombylans* and *plumata* (Deg.) occur; found along the edges of the woodland. Visited Hogweed umbels.

V. inanis (L.) Aug., only found about U.E. pond, visiting Water Mint flowers.

V. inflata (F.). June, in open clearing in woodland. Visited Elderberry flowers.

V. pellucens (L.). June to Sept., about the edges of, and in the open clearings of, the woodlands. Visited flowers of Bramble, Devil's-bit Scabious, Hogweed, and Water Mint.

Xanthogramma citrofasciatum (Deg.). C.O.H. reports the capture of one on 12th June 1948.

X. pedissequum (Harris) [=*ornatum* Mg.]. May, July, C. plain and about I. of W. pond and in Stents wood West.

Zelima [*Xylota*] *lenta* (Mg.). June, July, also taken by Col. Bensley and P.W.E.C.

Z. segnis (L.). May, June, Aug., Sept., almost invariably on bramble leaves or at least on leaves of herbage, in the plains, about the pond margins and in open woodland. Females found visiting Buttercup flowers.

Z. sylvarum (L.). June to Sept., apparently confined to the low herbage of the Hollows and Eastern ponds.

SCHIZOPHORA—ACALYPTERAE.

CONOPIDAE. Larvae parasitic on *Hymenoptera* and *Orthoptera*.

Conops flavipes L. Aug., Sept., on plains and about the ponds, visited flowers of Keck and Water Mint.

C. quadrifasciata Deg. July, Aug., on the plains and about the ponds, visitor to flowers of Keck, Field Thistle, and Sneezewort.

Myopa buccata (L.). June, visited Hawthorn flowers at edge of C. wood.

M. testacea (L.). June, visited Hawthorn flowers in scrub edging Hill House wood and C. wood.

Physocephala rufipes (F.). July, flying about the edge of L.E. pond.

Sicus ferrugineus (L.). July, resting on bracken in the open part of C. wood and at the margin of I. of W. pond.

Thecophora [*Oncomyia*] *pusilla* (Mg.). Collected by P.W.E.C. off *Hieracium* sp on 3rd Oct. 1948.

OTITIDAE [ORTALIDAE]. Larvae feed on detritus.

Ceroxys [*Anacampta*] *urticae* (L.). Aug., about S.E. pond.

Otites [*Ptilonota*] *guttata* (Mg.). May, on leaves of birch in C. wood.

PALLOPTERIDAE.

Palloptera neutra Pand. 11th April to 12th May and on 14th Oct. (1945). This species has not previously been recorded for Britain as far as I am aware. Mr J. E. Collin informs me (*in litt.*) that he has taken it himself and Mr R. L. Coe has found that there were specimens in the undetermined material at the British Museum (Nat. Hist.). I find it always associated with the margins of ponds of Kelseys and Sheepbell wood, and of large pools in C. wood. It therefore appears to need shade conditions and moisture.

P. saltuum (L.). Female on umbels, E. hollow, 13th July 1947 (C.N.C.).

PIOPHILIDAE. Larvae are found on decomposing animals.

Piophila vulgaris Fln. May, found on dead rabbit (E. Wood) and dead crow (S.E. wood), and swept from nettlebed along the western edge of Bay. plain.

DRYOMYZIDAE. Larvae breed in rotting vegetable matter.

Dryomyza flaveola (F.). Both sexes in S.E. wood, feeding on Stinkhorn fungus, *Phallus impudicus* Pers., 3rd Oct. 1948.

Var. *zawadskii* Schum. Jan., Feb., Nov., on birch stump on E. plain, about I. of W. pond and on the fungus, *Amanita muscaria* (L.) Fr., near High Point.

Neuroctena anilis (Fln.). Sept. to Nov., mostly in woods, but a female was found on a dead mole on C. plain, near S.E. wood. Besides visiting dead moles in C. wood, also noted on Stinkhorn fungus, *Phallus impudicus* Pers., the fungus *Coprinus comatus* (Fl. Dan.) Fr., a slime fungus on an oak and also on other unidentified fungi.

TRYPETIDAE [TRYPANEIDAE]. Larvae mostly gall makers, others mine leaves, live in the flowerheads or stems. Nomenclature—J. E. Collin, *Ent. Rec.*, 1947 *Supplement*.

Chaetostomella onotrophes Lw. [*Trypeta cylindrica* R.D.]. July, Aug., on Marsh Thistle on C. and E. plains, I. of W. pond margin, and E. hollow.

Ensina sonchi L. July to Sept., C. plain visiting Corn Sowthistle, bred specimens from larvae, found 13th July, emerged on 20th July, pupae also found on 11th Sept. 1949.

Hoplochaeta [*Noeta*] *pupillata* (Fln.). H.J.B. records in *L.N.*, 1945, p. 65, the galls of this species on Umbellate Hawkweed.

Icterica [*Xyphosia*] *westermanni* (Mg.). Aug., Sept., confined to, and found below the flowerhead of Hoary Ragwort, C. plain.

Myopites blotii Bréb. Bred from galls on Fleabane. Emerged 9th July. Galls found about I. of W. pond and on Bay. plain.

Oxyna flavipennis (Lw.). M.N. reports finding larvae in the roots of Yarrow. *Achillea millefolium.*

Paroxyna elongatula Lw. M.N. bred this species (det. J. E. Collin) from heads of *Bidens tripartita* collected 12th Aug. 1949, emerged 31st Aug. 1949.

Phagocarpus permundus Harris [*Anomoea antica* Wied.]. July to Sept., generally on its food plant, Hawthorn, but also taken on bracken, C. plain, and in a gun pit of E. plain.

Philophylla heraclei (L.). May, June, found at north end of U.E. pond, and H.J.B. bred 3 females from mines in *Apium nodiflorum*, collected 17th July 1946, emerged 9th May 1947.

Sphenella [*Tephritis*] *marginata* Fln. H.J.B. recorded in *L.N.*, 1945, p. 65, galls on *Senecio erucifolius* L. on C. plain.

Spilographa [*Euribia*] *zoë* Mg. June, on Bay. plain.

Tephritis bardanae (Schrank). May, June, on Burdock, Hill House wood and near High Point.

T. [*Euaresta*] *conjuncta* (Lw.). Jan. to April, July, Aug., Oct. to Dec., almost confined to the plains, but occasionally taken off bracken in C. and E. wood. Visited Sallow bloom more than once. Generally found in bracken litter in winter.

T. vespertina (Lw.). March, June to Sept., Nov., only found on the plains, generally on bracken.

Trypanea stellata (Fuess.) M.N. reports finding the larvae on *Senecio* sp.

Trypeta [*Orellia*] *falcata* (Scop.). M.N. reports finding the larvae in the roots of Goat's Beard (*Tragopogon pratense* L.).

T. ruficauda (F.). July. Aug., numerous on Field Thistle on E. and C. plain, but also found on Marsh Thistle in K. wood.

T. tussilaginis (F.). July, on Burdock, Sheepbell and E. wood.

Urophora [*Euribia*] *cardui* (L.). June, July, but bred specimens also emerged as early as 5th May. The well-known "gooseberry" galls of this species, on Field Thistle, are found all over the plains, about the drier parts edging the ponds and even woodland paths. During some years the galls are extremely abundant. As many as 11 galls found on a stem and the contents of a gall vary from 2 to 6 individuals. Larvae found up to Oct. A number of galls have been found damaged by birds, and Great Tits have been identified pecking them and extracting larvae or pupae. In Oct. 1947, in one area of 3 square yards near the station, 107 thistle plants had an average of 2 galls per plant, i.e., over 200 galls (one having 11 galls), holding at least 800 larvae and/or pupae.

U. jaceana (Her.). H.J.B. records galls on *Centaurea pratensis* Thuill. from Bay., C. and E. plains, in *L.N.*, 1945, p. 65.

U. quadrifasciata (Mg.). Aug., I. of W. marsh.

U. stylata (F.). July, but bred specimens also emerged in June. Up to eight larvae and pupae have been found in the galled heads of *Cnicus lanceolatus*. Found on C. and W. plains.

Xyphosia miliaria (Schrk.). June to Aug., on both Field and Marsh Thistles, on all plains and throughout the woods wherever these plants grow.

LONCHAEIDAE. Breed in living and rotting plants.

Lonchae chorea (F.). May, W. plain.

A number of specimens await identification on the revision of the systematics of the family promised by Mr J. E. Collin.

LAUXANIIDAE [SAPROMYZIDAE]. Larvae breed in living or rotting plants. Nomenclature—J. E. Collin, *Trans. R. ent. Soc.*, 99: 225 (1948).

Aulogastromyia anisodactyla (Lw.) [*A. fuscicornis* Macq.]. Aug. to Oct., on bracken of C. plain and on leaves of oaks of E. wood and about U.E. pond.

Calliopum [*Lauxania*] *simillimum* (Collin). June, July, margin of I. of W. pond.

Lyciella [*Sapromyza*] *decipiens* (Lw.). May to July, on herbage of marshy areas about Manor House and L.E. ponds, in E. hollow and C. wood.

L. platycephala (Lw.) [*Meiosimyza*/*Sapromyza difformis* Lw.]. June, on leaves of oak in E. wood.

L. rorida (Fln.). June, July, Sept., Oct., found on both C. plain at the margins of the woodland and in the shade areas of the main woodland.

L. subfasciata (Zt.). Several taken in the woods in Sept.

Minettia lupulina (F.). July, Sept., swept off bracken on C. plain.

M. rivosa (Mg.). June, July, Sept., very numerous on bracken, C. and E. plains.

Peplomyza litura (Mg.) [*P. wiedemanni* Lw.]. Aug., on grass stems, E. plain.

Sapromyza hyalinata (Mg.). June, July, on leaves of oaks edging E. plain.

S. sordida Hal. Sept., on leaves of oaks in C. wood.

Tricholauxania praeusta (Fln.). June to Sept., on low herbage in, and at the margins of, the woodland.

TYLIDAE [MICROPEZIDAE].

Trepidaria [*Calobata*] *petronella* (L.). June, July, on nettles by the road, S.E. wood, and Sheepbell wood.

PSILIDAE. Larvae breed in living plants; includes the carrot-fly.

Chyliza leptogaster (Pz.). June, July, E. wood and found on the window of Bayfield Hotel.

Loxocera albiseta (Schrk.). July, Sept., on herbage by grass track through E. wood.

Psila fimentaria (L.). June, in C. wood off the leaves of oaks.

P. lefebrei (Zt.). Sept., on leaves of oaks at over 8 ft. up at margin of E. plain.

P. nigricornis Mg. May, June, swept in woods.

SEPSIDAE. Larvae breed in rotting vegetable matter.

Nemopoda nitidula (Fln.) [*N. cylindrica* F.]. May, Bay. and W. plains and on dock leaves of Station copse.

Sepsidimorpha pilipes (V. der W.). May, on nettles of hedgerow of Bay. plain.

Sepsis ciliforceps Duda. A male on vegetation of L.E. pond on 13th April 1947 (C.N.C.).

S. cynipsea (L.). April, May, Oct., I. of W. marsh and W. hollow and found coupled on Sallow bloom in C. clearing.

S. fulgens Mg. Feb., May, Aug. to Nov., well distributed in marshes and woodland. Found in grass tufts and under litter, in winter, and on low herbage in summer.

S. punctum (F.). April, swept from *Juncus*, E. hollow.

Themira lucida (Staeg.). May, in Station copse.

T. putris (L.). May, on W. plain.

SCIOMYZIDAE [TETANOCERIDAE]. Larvae in rotting vegetable matter, some parasitic on mollusca. Adults generally found in wet places.

Bischofia simplex (Fln.): Aug., C. wood.

Ditaenia cinerella (Fln.). May, July, about Manor pond and in Stents wood West.

Elgiva cucularia (L.). June, July, swept from the margin of L.E. pond.

E. sundewalli (Fries.) [*E. rufa* Pz.]. Feb., March, Aug., swept from *Juncus* of U.E. pond.

Hydromyia [*Elgiva*] *dorsalis* (F.). Jan., Feb., April, May, Aug., Nov., off bracken of E. plain; but also in *Juncus* of L.E., U.E. and Manor ponds.

Ilione [*Elgiva*] *albiseta* (Scop.). June to Oct., in marginal vegetation of the I. of W., L.E. and U.E. ponds, and ditches of C. plain and damp areas in E. wood.

I. lineata (Fln.) Aug., Sept., in marginal vegetation—*Mentha*, *Epilobium*—of U.E. pond.

Limnia [*Euthycera*] *fumigata* (Scop.) [*rufifrons* F.]. June, in marginal vegetation of I. of W. pond.

L. unguicornis (Scop.). June, Sept., in marginal vegetation of U.E. pond.

Pherbellia [*Ditaenia*] *schönherri* (Fln.). Feb. to May, July to Sept., in marshy areas of *Juncus*, *Mentha*, *Epilobium* of all the ponds.

Pherbina communis R.D. [*Tetanocera punctata* F.]. Feb. to June, Aug. to Oct., in marginal *Juncus*, *Mentha* and *Epilobium* about I. of W., L.E. and U.E. ponds and W. hollow.

P. coryleti (Scop.). June to Oct., in marginal vegetation of I. of W. and U.E. pond.

Sciomyza dorsata Zt. May, July, in marginal vegetation of the ponds.

S. dubia Fln. July, on nettles of Station copse.

S. obtusa Fln. Sept., Oct., on mud of the drying I. of W. and U.E. ponds.

S. ventralis Fln. May, on leaves of oaks edging E. wood, and at the margin of Manor pond

Sepedon sphegeus (F.). April, Sept., at the margin of I. of W. pond and in E hollow.

S. spinipes (Scop.). April to Nov., mostly confined to marginal vegetation of I. of W., L.E. and U.E. pond, but also found at Sheepbell and Manor ponds and in W. hollow, at marshy areas in E. wood and once swept from bracken on E. plain.

Tetanocera elata (F.). June to Sept., occurs both on the plains, about the ponds and edges of E. wood and Station copse.

T. ferruginea Fln. May, on herbage of I. of W. ditch.

T. hyalipennis v. Ros. [=*laevifrons* Lw.]. July, Aug., Oct., on nettles by the road through S.E. wood, also at K. wood, I. of W. marsh and W. hollow.

T. robusta Lw. July, Sept., margin of I. of W. pond and E. hollow.

Trypetoptera punctulata (Scop.). July, in E. wood.

CHAMAEMYIIDAE [OCHTIPHILIDAE]. Larvae occur in plant galls, and are carnivorous.

Chamaemyia aridella (Fln.). Sept., E. hollow.

HELOMYZIDAE. Larvae are coprophagous, mycetophagous or saprophagous.

Helomyza affinis Mg. May, June, Aug., Sept., Nov., well distributed on fungi in the woods.
H. bicolor (Zt.). Sept., Oct., on fungi in C. and S.E. wood and W. hollow.
H. dumicola Collin. Oct., E. wood.
H. flavifrons Zt. April, May, females on mud by stream of W. plain and on grass marsh by stream of C. plain.
H. humilis Mg. June, swept under oaks at S.E. wood.
H. inornata Lw. Oct., Nov., in S.E. wood.
H. notata Mg. var. *hilaris* Zt. Sept., Nov., Dec., visiting fungi, S.E. wood, and at margin of I. of W. pond.
H. ustulata Mg. Feb., swept from *Juncus* tuft at U.E. pond.
H. variegata Lw. June, Sept., on fungi in S.E. wood.
Heteromyza rotundicornis (Zt.). Jan., flying in the sunshine by I. of W. pond
Leria serrata (L.). March, female resting on telegraph pole, Manor Oak path.
Neoleria inscripta (Mg.). May, females on dead rabbit in E. wood; both sexes on dead crow in S.E. wood.
N. ruficauda (Zt.). May, on dead crow, S.E. wood, C.N.C.
Tephrochlamys rufiventris (Mg.). Oct., Nov., Bay. plain and on Bayfield Hotel window.
T. tarsalis (Zt.). Bred from squirrel's drey in Hollow wood, emerged on 16th April 1949.

ANTHOMYZIDAE. Larvae are saprophagous or phytophagous.

Anthomyza sordidella (Zt.). July, Sept., about I. of W. and L.E. ponds.

OPOMYZIDAE. Larvae are internal plant feeders forming mines.

Geomyza combinata (L.). Aug. to Oct., Bay. and E. plains and C. wood.
G. tripunctata Fln. April, swept from *Juncus* about the ponds.
Opomyza germinationis (L.). June to Sept., on low herbage in the woods and about L.E. pond.

EPHYDRIDAE. Larvae are terrestial, aquatic, carnivorous, saprophagous or leaf-miners.

Coenia curvicauda Mg. March, April, in marginal vegetation of the ponds and of the ditch of C. plain.
C. fumosa Sten. March, Oct., in marginal plants of L.E. and U.E. pond and on bracken by gun pits, E. plain.
C. palustris (Fln.). Nov., off bracken, E. plain.
Dichaeta caudata (Fln.). Feb., March, July to Nov., from *Juncus*, dead *Scirpus*, and mud margins of L.E., U.E. and I. of W. ponds.
Hydropota [*Hydrellia*] *griseola* (Fln.). April to June, well distributed in *Juncus* and marginal plants of all ponds and bomb craters.
Notiphila cinerea Fln. May to Aug., in marginal vegetation of Bay and I. of W. ponds and in marshy areas of E. wood and C. plain.
N. dorsata Stenh. July, Aug., at mud edge of U.E. and I. of W. ponds.
N. riparia Mg. Aug., I. of W. pond.
N. uliginosa Hal. April, from *Juncus* at margin of I. of W. pond.
Parydra aquila (Fln.). March, brook of Bay. plain (C.N.C.).
P. coarctata (Fln.). March, May to Aug., Oct., Nov., on mud, in *Juncus* and dead *Scirpus* and temporary pools in the woods, but chiefly at the various ponds.
P. fossarum (Hal.). March, Aug., Oct., Nov., at temporary pools in the woods and at margins of the various ponds.
P. quadripunctata (Mg.). March, June to Nov., at mud margins of the ponds and pools, including those in the woodland.

Pelina aenea (Fln.). April, on mud of L.E. pond (C.N.C.).
Psilopa compta (Mg.). May, in *Juncus* of Bay. pond and in E. and W. hollows.
P. nitidula (Fln.). Sept., margin of I. of W. pond.
Scatella paludum (Mg.). May, off vegetation of L.E. pond (C.N.C.).
S. stagnalis (Fln.). March, May, June, Sept., in *Juncus* at edges of I. of W. and U.E. ponds.
S. subguttata (Mg.). May, off vegetation of L.E. pond (C.N C.).
S. tenuicosta Collin. July, on mud at the margin of U.E. pond.

SPHAEROCERIDAE [CYPSELIDAE/BORBORIDAE]. Larvae breed in animal dung and rotting vegetable matter.

Collinellula breviceps (Stenh.). April, by path through the woods north of E hollow (C.N.C.).
C. lutosa (Stenh.). March, April, Bay. plain and in E. wood (C.N.C.).
Limosina bifrons Stenh. April, E. wood (C.N.C.).
L. luteilabris Rond. May, July, by L.E. pond and in nettles of W. hollow (C.N.C.).
Opacifrons coxata (Stenh.). Feb., swept from reeds, W. hollow (C.N.C.).
Paracollinella curvinervis (Stenh.). April, in E. woods (C.N.C.).
P. fontinalis (Fln.). June, Nov., on low ground herbs in Hill House and S.E woods and Manor House marsh.
Pteremis nivalis (Hal.). Feb., in grass tufts by gun pits, E. plain.
Sphaerocera curvipes Latr. April, on fairly fresh horse dung, K. clearing and W. plain.
Spinotarsella humida (Hal.). May, by L.E. pond (C.N.C.).
Stratioborborus [Cypsela] fimentarius (Mg.). April, May, Dec., in the woods on pheasant dung, dead crow, dead mole, and on leaves of a Sycamore.
S. nitidus (Mg.). May, June, Oct., Nov., in the woods, near horse dung and on dead leaves under the trees.
Trichiaspis [Cypsela] equina (Fln.). March, April, on fresh horse dung, W. plain and E. hollow.
T. similis (Collin). Feb. to April, Dec., commonest species of this genus on the plains and in the woods. On fresh horse dung, at mouths of rabbit burrows, in clumps of *Juncus* and on dead leaves under the trees.
T. stercoraria (Mg.). March, May, June, on fresh horse dung, and swept from bracken in woods, plains, about the ponds and in E. hollow.

ASTEIDAE. Larvae bred from rubbish of hollow trees.

Asteia amoena Mg. May, Sept., Oct., Dec., S.E. wood, Bay. plain and margin of I. of W. pond, also on window of Bayfield Hotel.

DIASTATIDAE.

Diastata adusta Mg. March to May, Nov., in *Juncus* and *Equisetum* areas edging the ponds and in the hollows.
D. fuscula (Fln.). Oct., S.E. wood.
D. fulvifrons Hal. Oct., on ground herbage of S.E. wood.
D. unipunctata Zt. March, April, vegetation edging. I. of W. pond, L.E. pond and W. hollow (C N.C. and L.P.).

CAMILLIDAE.

Camilla glabra (Fln.). One on 11th June 1939.

DROSOPHILIDAE. Larvae live in rotting vegetable matter.

Drosophila fenestrarum Fln. April. in *Juncus* clumps.
D. funebris (F.). Oct., on slime fungus on oak, S.E. wood with the following species.
D. obscura Fln. and
D. phalerata Mg.
D. disticha (Duda). July, Oct., off herbage of I. of W. ditch and on C. plain.
D. graminum (Fln.). Feb., April, in W. hollow (C.N.C. and L.P.).

AGROMYZIDAE. Larvae are internal plant feeders, mostly leaf miners.

Agromyza anthracina Mg. Not previously recorded as British. I have found mines attributed to this species on several occasions in leaves of nettles, *Urtica dioica*, and Mr M. Niblett reared flies, emerging 17th December 1948, from mines collected in Nov. Larvae found at Station copse and Hill House wood.

A. reptans Mg. Also mines in the leaves of nettles, found at Station copse, Hill House wood, and Hollow wood.

A. spiraeae Kltb. Mines leaves of *Potentilla erecta* in E. hollow.

Dizygomyza capitata (Zt.). July, at the margin of U.E. pond.

Metanagromyza schineri Gir. H.J.B. records the galls attributed to this species on *Salix atro-cinerea* and *Populus tremula* in *L.N.*, 1945, pp. 66-7.

M. simplicoidea Hend. H.J.B. records galls attributed to this species on *Salix atro-cinerea, S. caprea, Populus tremula* in *L.N.*, 1945, pp. 66-7, and 1941, p. 14.

Napomyza glechomae (Kalt.). Mines leaves of Ground Ivy, S.E. wood. From pupae collected in Nov. Mr Niblett bred flies by 4th December.

N. lateralis Fln. M.N. reports emergences on 17th Aug. from larvae found in flowers of *Matricaria inodora* collected in July

Phytomyza agromyzina Mg. Larvae attributed to this species found mining the leaves of Dogwood, Bay. plain hedgerow in Sept.

P. crassiseta Zt. Pupae attributed to this species found in leaf mines of *Veronica*, S.E. wood, in November.

P. ilicis Curtis. The well-known leaf miner of the Holly is well distributed in the woodland and flies bred emerged in May.

P. nigra Mg. Feb., a male found in grass tuft on E. plain on 13th Feb. 1949 (det. J. E. Collin).

P. ranunculi (Schrk.). April, May, Oct. Mr J. E. Collin has determined a number of my captures of this species from the vegetation along the I. of W. ditch and about the ponds. I have so far found the leaf mines to be uncommon.

P. ranunculi (Schrk.) var. *flava* Fln. One taken in the Hollows on 1st Sept. 1935, so det. by Mr J. E. Collin.

MILICHIIDAE.

Madiza glabra Fln. April, males at Sallow bloom, K. pond.

CHLOROPIDAE. Larvae are mostly plant feeders, miners and gall-makers. A few are parasitic on eggs of spiders.

Anthracophaga strigula (F.) [=*Chlorops cingulata* Mg.]. H.J.B. has found the galls attributed to this species.

Aphanotrigonum trilineatum (Mg.). Feb., in grass tuft, E. plain.

Chlorops glabra (Mg.). Oct., off low herbs of C. wood.

C. hypostigma Mg. June, July, about L.E. pond and in E. wood.

C. myopina (Lw.). Aug., in C. wood.

C. pumilionis (Bjer.). May, Aug., Oct., on C. and E. plains, in C. and S.E. woods.

C. speciosa Mg. June to Sept., all over the plains and about the ponds and in C. wood.

Dicraeus vagans Mg. June, July, on herbage of C. plain ditch, E. hollow and Stents wood.

Elachiptera cornuta (Fln.). Feb. to May, in *Juncus* and grass tufts and beaten from dead *Clematis* over a Holly, on the plains about the ponds and in C. wood.

E. diastema Collin. Feb., in grass tufts, E. plain.

E. megaspis (Lw.). March, May Bay. and E. plains, vegetation of L.E. pond (C.N.C. and L.P.).

E. tuberculifera (Corti). Feb., in gun pit, E. plain, near S.E. wood.

Lasiosina cinctipes (Mg.). May, in *Juncus* clump, Bay. pond.

Meromyza saltatrix L. var. *variegata* Mg. July, on E. plain.

Oscinetta frit (L.). Frit fly, May to Sept., found on the plains, in the woods, and about the ponds.

O. nigerrima (Mcq.). May, on Bay. plain.

O. nitidissima Mg. May, at margin of Manor pond and L.E. pond (L.P. and C.N.C.).

Siphonella oscinina (Fln.). Aug., on C. plain.

Siphunculina aenea (Mcq.). June, Oct., Bay. plain and also taken on window of Bayfield Hotel.

Thaumatomyia notata (Mg.). May, July, Oct., Bay. plain, Manor pond margin and in Stents wood West.

T. trifasciata (Zt.). April, May, on vegetation of brook, C. plain, and surface vegetation of L.E. pond (C.N.C.).

Tricimba cincta (Mg.). Oct., on May. plain

CALYPTERAE.

CORDILURIDAE [SCATOPHAGIDAE]. Larvae are phytophagous or coprophagous. Certain adults are predaceous.

Amaurosoma fasciata (Mg.). April to June, in long grass in the woods, on E. plain and about the ponds.

A. inerme Becker. May, Bay. pond in grass at its edge.

A. tibiellum (Zt.). May, Bay. pond.

Cnemopogon apicalis (Wied.). A male taken on 12th June 1941.

Cordilura pubera (L.). A male taken on 11th June 1939.

Norellia spinimana (Fln.). April, May, July, Sept., Station copse, Hill House wood, K. wood, and about I. of W. pond. Bred from *Rumex* species, also found resting on Bramble leaves and the lower ones of Sycamore.

Parallelomma albipes (Fln.). June, on herbage about C. plain ditch.

Scopeuma [*Scatophaga*] *anale* (Mg.). Nov., E. plain and by the I. of W. pond.

S. decipiens (Hal.). Nov., swept from dead *Scirpus* at U.E. pond.

S. inquinatum (Mg.). May, mostly on waterside herbage on C. plain, I. of W. ditch, but also in Hill House wood.

S. lutarium (F.). June, Oct., Station copse, W. hollow.

S. maculipes Zt. May, in *Juncus* of ditch of I. of W. plain, C. and Hill House woods.

S. squalidum (Mg.). Feb. to June, mostly in *Juncus* about the ponds, but also on human dung in a gun pit on E. plain, and visited Buttercup flowers.

S. stercorarium (L.). Common Dung Fly. Feb. to Nov., well distributed all over the area. Visited flowers of Blackthorn, Coltsfoot, Dandelion, Hogweed and Sallow. Females seen ovipositing in cow pats but also seen to visit horse dung several times. Prey included *Episyrphus balteatus* Deg. and *Muscidae* spec.

S. suillum (F.). May, in Hill House wood.

LARVAEVORIDAE [TACHINIDAE]. Larvae are mostly parasitic on *Lepidoptera* but some on Beetles, Woodlice, etc.

Actia antennalis (Rond.). Mr E. C. d'A. Fonseca reports taking this species on 11th July 1948.

A. frontalis (Macq.). Bred from larva of *Eucosma pfugiana* Fab. [*Lep.-Eucosmidae*] found mining the stems of Marsh Thistle, *Cirsium palustre* (L.) Scop.

A. nigrohalterata Vill. May, on leaves of oak in E. wood.

A. pilipennis (Fln.). June, July, E. wood and C. plain, on leaves of oaks.

Allophora hemiptera (F.). May, July, Aug., Hill House wood and about I. of W., L.E. and U.E. ponds. Visited Hawthorn, Hogweed and Wild Parsnip flowers.

Bessa selecta (Mg.). Aug., on E. plain.

Blondelia nigripes (Fln.). July, C. and E. plains and about L.E. ponds.

Campylocheta obscura (Fln.). March, April, resting on trunks of oaks of C. and S.E. woods, E. plain and L.E. pond.

Cleonice grisea (Fln.). Sept., Oct., in C. and S.E. wood.

Crocuta [*Bucentes*] *geniculata* (Deg.). May to Oct., mostly on plains and about the ponds. Visited flowers of Buttercup, Devil's-bit Scabious, Fleabane, and Ragwort.

Cylindromia interrupta (Mg.). A male was taken by P.W.E.C. off bracken, C. plain, on 29th June 1947.

Cyzenis albicans (Fln.). April, May, on birch trunk and resting on foliage, in the woods and on E. plain and at Station copse.

Dexiosoma caninum (F.). Aug., on bracken on C. plain and on Hazel leaf in C wood.

Epicampocera succincta (Mg.). July, on an umbel, W. hollow (C.N.C.).

Eriothrix rufomaculatus (Deg.). Aug., Sept., E. plain and about I. of W. pond. Visited flowers of Wild Parsnip and Devil's-bit Scabious.

Ernestia nielsenii (Vill.). May, June, about the ponds and in open areas of the woods, generally resting on the leaves of hazel and oak.

E. rudis (Fln.). May, June, in woods. Visited flowers of Hawthorn.

Ethilla tritaeniata (Rond.). Female swept, C. plain, 13th July 1947, by C.N.C. [det. H. Audcent].

Exorista larvarum (L.). May, about Manor pond, prey of the spider, *Dictyna arundinacea* L. [*Dictynidae*].

Fausta nemorum (Mg.). Aug., in I. of W. marsh.

Gymnocheta viridis (Fln.). March to May, throughout the woods. Males almost always found resting on tree trunks, chiefly oaks and generally with head downwards. Females were found "sunning" on bare paths in C. wood.

Hyalomyia obesa (F.). July, on C. plain visiting Hogweed umbel.

Larvaevora [*Echinomyia*/*Tachina*] *fera* (L.). May, June, Aug. to Oct., often numerous on the plains, about the ponds and in the open areas and paths of the woods. Visited flowers of Angelica, Devil's-bit Scabious, Hawthorn, Keck, and Water Mint.

L. ferox (Pz.). July, a male on leaves of herbage at margin of L.E. pond, 14th July 1946. C.O.H. found three males there on 18th July 1948.

Lydella grisescens R.D July, Sept., Stents wood East.

L. stabulans (Mg.). June, July, on the plains, about the I. of W. and L.E. ponds and in Stents wood East.

Lypha dubia (Fln.). March to May, males mostly on leaves of birch, hazel and hawthorn, sometimes on trunks of oak, females on short turf of the paths in the sun in all woods.

Macquartia chalconata Mg. var. *tenebricosa* (Mg.). A male taken on 26th Aug. 1934.

M. praefica (Mg.). July, Aug., only noted about I. of W. pond. Visited flowers of Meadowsweet and Wild Parsnip.

Meigenia bisignata (Mg.). Sept., in C. wood.

M. mutabilis (Fln.). July, in S.E. wood.

Meriania puparum (F.). March, April, in all woodland area and edge of E. plain. Almost only males have been found by C.N.C., P.W.E.C., C.O.H., and myself, on the ground of the woodland paths, or sunning on trunks of oaks and on sycamore leaves. Females taken on dead bracken and bare sandy soil by C.O.H. and myself are apparently the only females taken in this country.

Neaera albicollis (Mg.). E. C. d'A. Fonseca reports taking this species on 11th July 1948.

Nilea [*Neopales*] *pavida* (Mg.). June, July, Sept., C. and E. wood, and on herbage of C. plain ditch.

Oswaldia muscaria (Fln.). May, June, throughout the woodlands, generally on leaves of the shrubs and lower branches of the trees.

Paralophora pusilla (Mg.). July, at the bank of L E. pond.

Phorocera assimilis (Fln.). May, June, in most of the woodland, also about the ponds and even in the open area of E. plain. Generally males are noted resting on the leaves of hazel, hawthorn, oaks and birches.

P. vernalis R.D. [*caesifrons* Macq.]. April to June, chiefly in the woods but at times on the plains resting on the trunks of oaks and leaves of birch, hazel, hawthorn, occasionally on the ground. Visited sallow bloom. Prey of *Empis tessellata* F.

Phryno vetula (Mg.). April, May, June, in all woods, males noted on leaves of oaks and sycamore and often in sun on turf or ground of the paths. Prey of *Empis tessellata* F.

Phryxe vulgaris (Fln.). July, Aug., C. plain and E. hollow.

Rhodogyne [*Gymnosoma*] *rotundatum* (L.). Taken by C.N.C. on Hogweed umbel on 13th July 1947, and a male by C.O.H. on 18th July 1948.

Salmacia [*Gonia*] *divisa* (Mg.). March to May, all over the plains and about I. of W. and L.E. pond, W. and E. hollows, generally on rough grassland. Visited flowers of Blackthorn, Greater Stitchwort and Sallow.

S. sicula (R.D.) [*fasciata* Mg.]. March, April, all plains, but also in open clearings in the woodland where rough grassland is present. Flies low over the grass, suns thereon but a male on one occasion kept returning to a discarded paper bag left by a " member of the public."

S. ornata (Mg.). April, E. plain and C. clearing, in C. wood on rough grassland. Visited Blackthorn flowers.

Servillia ursina (Mg.). March to May, in open areas of the woods and about their margins. Visited flowers of Hawthorn, white paper, and my hand!

Smidtia [*Epicampocera*] *conspersa* (Mg.). May, C. clearing in C. wood and E. hollow.

Thelaira leucozona (Pz.) [*nigripes* F.]. July, C. and S.E. woods and about L.E. pond resting on the leaves of the herbage, especially large leaves such as those of Coltsfoot and also on the lower leaves of oaks in the sunshine.

Trixa caerulescens Mg. May, in Hill House wood and I. of W. plain, on hazel leaves, young bracken, and visited Hawthorn flowers.

T. oestroidea (R.D.). Female taken on 11th June 1939, and C.O.H. reports a capture of this species on 18th July 1948.

Varichaeta [*Ernestia*] *consobrina* (Mg.). Aug., C. plain and by the I. of W. pond. Visited the flowers of Wild Parsnip.

V. radicum (F.). Aug., C. and E. plains and by the I. of W. pond. Visited the flowers of Wild Parsnip and Marsh Ragwort.

Voria ruralis (Fln.). Sept., Oct., C. wood, and off bracken in E. plain.

Wagneria costata (Fln.). A female on 11th June 1939.

CALLIPHORIDAE. Some larvae are parasitic on *Hymenoptera*, mollusca, earthworms. Others are coprophagous. Includes most of the Bluebottles and Greenbottles.

Brachicoma devia (Fln.). E. C. d'A. Fonseca reports taking this on 11th July 1948.

Calliphora erythrocephala (Mg.). March to Nov., everywhere. Bred from dead rabbit, mole, and blackbird, emerged as early as 10th Jan. Visited flowers of Hogweed and also Stinkhorn fungus, *Phallus impudicus*.

C. vomitoria (L.). May, July to Oct., not so numerous as *C. erythrocephala*, but as widely distributed. Visited flowers of Wild Parsnip and Stinkhorn fungus.

Cynomya mortuorum (L.). July, Aug., W. hollow and about I. of W. pond. Visited flowers of Wild Parsnip.

Lucilia ampullacea Vill. Oct., male on Stinkhorn fungus, *Phallus impudicus*, S.E. wood.

L. bufonivora Mon. June, Aug., on bracken, C. plain and in Sheepbell wood.

L. caesar (L.). May to Sept., all areas, visited Wild Parsnip flowers, also seen on dead rabbit.

L. illustris (Mg.). A male on 1st Sept. 1935.

L. sericata (Mg.). May, Aug., E. wood, on dead rabbit, and C. plain on Wild Parsnip flower.

L. silvarum (Mg.). July, E. hollow.

Melina caerula (Mg.). March, July, Aug., C. wood, W. hollow, and about U.E. pond.

Metopia argyrocephala (Mg.) [*leucocephala* Rossi]. A male on 11th June 1939.

Morinia nana (Mg.). June, July, about Manor House pond.

Nyctia halterata (Pz.). May to Aug., in E. wood, about U.E. and I. of W. pond and at Station copse. Visited Wild Parsnip flowers.

Pollenia rudis (F.). March, April, July to Nov., abundant, well distributed. Often found sunning on tree trunks. Visited flowers of Sallow, Wild Parsnip, Devil's-bit Scabious, and Yarrow.

P. rudis angustigena Wainw. A male taken on E. plain, 10th Nov. 1946.

P. varia (Mg.). June, Aug., E. plain and Manor House marsh.

P. vespillo (F.). April, C. clearing and E. hollow. Visited blossom of Sallow and Blackthorn.

Protocalliphora azurea (Fln.). April, E. plain, resting on trunk of birch in sunshine.

Rhinophora lepida (Mg.). E. C. d'A. Fonseca reports taking this species on 11th July 1948.

Sarcophaga carnaria (L.). July to Oct., mostly on the plains, but also in open areas of C. wood. Visited flowers of Angelica, Common Ragwort, Wild Parsnip, and Water Mint.

S. clathrata Mg. June, in E. wood.

S. crassimargo Pand. Aug., on E. plain.

S. incisilobata Pand. July, by the I. of W. pond.

S. scoparia Pand. May, W. plain, margin of Hill House wood, on dead leaves under the trees.

S. subvicina Rohd. May, July, Aug., Oct., mostly on the plains, but also found in S.E. wood and Station copse. Visited flowers of Hogweed and Wild Parsnip.

MUSCIDAE [ANTHOMYIIDAE]. Larvae are mostly coprophagous. Many are plant eaters, including pests of the vegetable garden. Some are predaceous. I have not yet identified many of my specimens of this family.

Alloestylus diaphanus (Wied.). A male taken on 11th July 1939.

Allognata agromyzina (Fln.). A female on 1st Sept. 1935.

Anthomyia pluvialis (L.). June, E. plain, on leaves of oaks.

A. procellaris Rond. June, July, woodland margin and paths on leaves of oaks.

Azellia macquarti (Staeg.). May, Station copse.

Chirosia albitarsis (Zt.). June, E. plain, on young bracken.

C. crassiseta (Stein). June, E. wood, on bracken.

C. parvicornis (Zt.). May to July, on young bracken on all the plains.

Coelomyia mollissima Hal. April, Stents wood.

Coenosia geniculata (Fln.). Aug., C. plain.

C. tricolor (Zt.). Swept in Sept. about I. of W. pond.

Dasyphora cyanella Mg. March to May, July, distributed over the plains and in the open areas of the woods. Generally noted sunning on tree trunks or resting on leaves. Visited flowers of Blackthorn and Sallow, also females were found several times on horse dung.

Egle muscaria (F.). March, April, E. plain, in the open areas of the woods, about the ponds and hollows; both sexes visited Sallow bloom. Also found resting in the sun on the trunks of oaks. Generally males are dominant at the Sallow, the females on the tree trunks. Males also patrol up and down, 8 to 14 feet above the ground, close to the sallows awaiting females. Males were attracted to white paper placed on the ground beneath the sallows. Fed on sallow pollen.

E. parva R.D. March, April, E. plain, E. and W. hollow. Both sexes at Sallow blossom, but females mostly rested in the sun on tree trunks. Fed on Sallow pollen.

E. radicum (L.). April, W. hollow (C.N.C.).

Erioischia brassicae Bouche. Sept., swept C. plain.

Eustalomyia histrio (Zt.). July, E. wood, male on oak trunk.

Fannia armata (Mg.). June, July, margin of E. and S.E. woods. Patrols under trees.

F. canicularis (L.). A male taken on 1st Sept. 1935.

F. coracina (Lw.). May, June, W. plain and E. wood.

F. manicata (Mg.). May, Hill House wood.

F. pretiosa (Schin.). July, E. hollow. Visited Hogweed umbel.

F. sociella (Zt.). May, June, Aug., Hill House and C. woods.

Graphomya maculata (Scop.). Aug., Sept., E. hollow, about the I. of W. and U.E. ponds. Visited flowers of Angelica, Devil's-bit Scabious, Wild Parsnip, Water Mint.

Hebecnema umbratica (Mg.). Oct., E. plain (C.N.C.).

H. vespertina (Fln.). May, July, C. plain, C. wood, Station copse, resting on hazel leaves and on bracken.

Helina impuncta (Fln.). Sept., on herbage about U.E. pond.

H. lucorum (Fln.). March to June, Oct., throughout the woods including Station copse; on leaves of shrubs, on leaves of oaks and on tree trunks.

H. pertusa (Mg.). Found in June.

Hydrophoria conica (Wied.). May, June, Aug., on plains, on C. and E. woods, and at Station copse.

H. ruralis (Mg.). Aug., C. plain.

Hydrotaea bimaculata (Mg.). June to Sept., C. plain, C. and E. woods, about I. of W. pond. Males circle about and alight on sallows and on bracken.

H. dentipes (F.). May, June, Nov., mostly in woods but also taken on C. plain. Females found on dead rabbit, dead mole, and dead crow. Also taken on window of Bayfield Hotel.

H. irritans (Fln.). July, E. wood.

H. meteorica (L.). May, Hill House wood, W. plain at margin of woodland.

Hylemya nigrimana (Mg.). May, visiting flowers of Lesser Celandine.

H. strenua R.D. [=*strigosa* F.]. April to July, Sept. to Dec., abundant, almost confined to woods but also found under trees at the edge of E. plain. Males almost always found resting on herbage under the trees. Females were seen on fungus in December.

H. variabilis Stein. April, Sept., margin of the woods by the ponds.

H. variata Fln. April, margin of the woods by the ponds.

Hylephila obtusa Zt. May, about the gun pits, E. plain.

Lasiops semicinereus (Wied.). May, June, E. and Sheepbell wood, W. hollow. Visited flowers of Buttercup.

Limnophora notata (Fln.). July, margin of U.E. pond, on Hogweed.

Lispocephala erythrocera (R.D.). March, April, Nov., in *Juncus* and *Equisetum* margin of the I. of W., Manor and Sheepbell ponds. Males seen with Chironomid prey, species indet.

Mesembrina meridiana (L.). May to Oct., on the plains but chiefly along the paths and in the open areas of the woods. Generally males seen sunning on the trunks of the oaks.

Morellia aenescens R.D. July, Aug., C. plain and E. wood.

M. hortorum (Fln.). July, C. wood.

M. simplex (Lw.). May, Aug., generally distributed and abundant. Males in numbers resting on leaves of low trees.

Musca autumnalis Deg. [=*corvina* F.]. March to Oct., well distributed, mostly on bracken in summer. Visited flowers of Angelica and Wild Parsnip.

M. domestica L. May, swept at verge of L.E. pond (C.N.C.).

Muscina assimilis (Fln.). March, May, July, on the plains and in the woods on leaves of hawthorns and sunning on tree trunks and on birch stumps.

M. pabulorum (Fln.). March, April, E. plain, S.E. wood and E. hollow, resting on trunks of oaks and stumps of birches.

Mydaea tincta (Zt.). June, July, C. and E. woods on bracken.

M. urbana (Mg.). July, C. plain and W. hollow on umbellifer (C.N.C.).

Myospila meditabunda (F.). Aug., Sept., in woods.

Ophyra leucostoma (Wied.). June, patrolling under the oaks at the margins of the woods.

Orthellia caesarion (Mg.). Nov., S.E. wood.

O. cornicina (F.). March to May, Nov., Dec., in woods and about the I. of W. pond and on W. plain. Visited flowers of Blackthorn and Sallow.

Paraprosalpia [*Prosalpia*] *billbergi* (Zt.). April, on turf path in sun, Stents wood.

Pegohylemyia discreta (Mg.). May, Aug., C. plain.

P. jacobaeae (Hardy). M.N. reports finding larvae in flowers of Hoary Ragwort, *Senecio erucifolius*, and flies emerged 29th June.

P. signata (Brischke). H.J.B. records the galls—occasionally—on bracken in *L.N.*, 1945, p. 67.

Pegomya bicolor (Wied.). May, July, Sept., Station copse, Stents wood and about Manor pond.

P. nigritarsis (Zt.). June, July, about Manor House marsh. Bred from mines in *Rumex acetosella* on E. plain, larvae found 12th June, flies emerged 2nd-4th July.

P. squamifera Stein. Oct., on bracken of E. plain (C.N.C.).

P. winthemi (Mg.). Oct., on bracken of E. plain (C.N.C.).

Pegomyza virginea (Mg.). June, in the woods.

Phaonia basalis (Zt.). June to Sept., distributed over the plains, in the Hollows and about U.E. pond. Visited flowers of Agrimony, Angelica, Devil's-bit Scabious, Fleabane, Forget-me-not, Hogweed, and Mountain Ash. Prey of the spider, *Misumena calycina* L. [*Thomisidae*] on Agrimony.

P. errans (Mg.). May, C. wood, on Hawthorn leaves.

P. erratica (Fln.). Found in Sept.

P. incana (Wied.). June, C. plain and Manor House marsh.

P. pallida (F.). July, about U.E. pond and in Stents wood West. Visited Hogweed umbels.

P. scutellaris (Fln.). July, about U.E. pond. Visited Hogweed umbels.

P. serva (Mg.). May, E. wood and W. hollow. Visited flowers of Buttercup and Lesser Celandine.

P. signata (Mg.). Nov., E. plain and about the I. of W. pond.

P. variegata (Mg.). Oct., S.E. wood, both sexes visited Stinkhorn fungus, *Phallus impudicus*.

Phorbia curvicauda (Zt.). April, swept from path in E. wood (C.N.C.).

Polietes lardaria (F.). May, June, Sept. to Nov., mostly along paths in the woods but at on C. plain. Females found on fresh horse, dog, and on human dung ovipositing, and on dead mole.

Pseudomorellia [*Polietes*] *albolineata* (Fln.). May, July, on plains and along paths and in open areas of wood, almost always males are found resting in sun on leaves of trees and shrubs. Also found on dead rabbit.

Pycnoglossa flavipennis (Fln.). July, C. and E. plains, E. wood. Abundant on bracken.

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Some Additional Records of Mammals, Reptiles, and Amphibia in the London Area.

By R. S. R. Fitter.

THE publication of "A Check-List of the Mammals, Reptiles and Amphibia of the London Area, 1900-49" (*London Naturalist*, No. 28, pp. 98-115) has brought in a substantial number of additional records, particularly for the water-shrew and for the south-eastern suburbs. The Recorder's thanks are due to the following observers for the material on which this supplementary paper is based: C. J. F. Bensley, M. Blackmore, J. F. Burton, S. H. Chalke, P. A. Colinvaux. A. E. Ellis, G. Johnstone, H. Murray, and D. F. Owen.

MAMMALIA.

Mole. *Talpa europaea* L.

Inner limit in S.E. London, Plumstead Marshes and Mottingham (J. F. Burton).

Common Shrew. *Sorex araneus castaneus* Jenyns.

Frequently found dead at Charlton Sand-pit, Shooter's Hill, Abbey Wood, Lee and Kidbrooke, and probably plentiful in all these S.E. London localities (J. F. Burton).

Pigmy Shrew. *Sorex minutus* L.

Skulls found in owl pellets at Hayes Common and Sundridge Park, Kent (J. F. Burton, D. F. Owen), and Stanmore, Middx. (P. A. Colinvaux); numbers also found dead at Sundridge Park (J. F. Burton).

Water-Shrew. *Neomys fodiens bicolor* (Shaw).

A colony on one of the lakes in Valentine's Park, Ilford, Essex, thirty years ago and one seen in 1949 (H. Murray). Specimens found dead at Bookham Common in March 1946 (C. J. F. Bensley) and in the quadrangle of Epsom College in October 1946 (A. E. Ellis), both in Surrey. Single skulls found in owl pellets at Hayes Common, Kent (D. F. Owen) and in December 1949 at Stanmore, Middx. (P. Colinvaux).

HEDGEHOG. *Erinaceus europaeus* L.

Seen near the Round Pond in Kensington Gardens more than once before the war (M. Blackmore), and one found in the Zoological Gardens, Regent's Park, in August 1949 (Zoological Society of London). In the Kentish sector still occurs in small numbers in Greenwich Park, and on Greenwich Marshes and Blackheath (J. F. Burton).

SEROTINE. *Eptesicus serotinus* (Schreber).

Epsom College, Surrey, one on October 6, 1937 (skin in College Museum) (A. E. Ellis).

BARBASTELLE. *Barbastella barbastellus* (Schreber).

Richmond Park, Surrey, two on October 4, 1946 (skins in Epsom College Museum) (A. E. Ellis).

FOX. *Vulpes vulpes crucigera* (Bechstein).

Edgwarebury, Middx., litters seen in 1946, 1948 and 1949 (P. A. Colinvaux).

BADGER. *Meles meles meles* (L.).

There is probably a set at Woodcote Park, Epsom, Surrey, as badgers have been seen there recently (A. E. Ellis).

STOAT. *Mustela erminea stabilis* Barrett-Hamilton.

Dartford Marshes, Kent, one in June 1949 (J. F. Burton).

WEASEL. *Mustela nivalis nivalis* L.

Foots Cray, Kent, one dead at Ruxley gravel-pit in February 1948 (J. F. Burton).

RABBIT. *Oryctolagus cuniculus* (L.).

Occurs plentifully in S.E. London at Shooter's Hill (Jackwood, Castlewood, Oxleas Wood and golf course), Abbey Wood, Bostall Wood, Plumstead Marshes, Elmstead Wood and Sundridge Park (J. F. Burton).

BROWN HARE. *Lepus europaeus occidentalis* de Winton.

Occurs sparsely on Thames Marshes as far upstream as Plumstead (J. F. Burton).

BANK-VOLE. *Clethrionomys glareolus britannicus* (Miller).

Skulls found in owl pellets at Hayes Common and Sundridge Park, Kent, and Sewardstone and Chingford, Essex (D. F. Owen).

WATER-VOLE. *Arvicola amphibius amphibius* (L.).

Plentiful on Thames marshes at Plumstead, Abbey Wood and further east, also along the R. Cray and at Ruxley gravel-pit, Foots Cray, Kent (J. F. Burton).

SHORT-TAILED FIELD-VOLE. *Microtus agrestis hirtus* (Bellamy).

Still plentiful at Shooter's Hill and in smaller numbers at Blackheath, Greenwich Park and Lee (J. F. Burton).

LONG-TAILED FIELD-MOUSE. *Apodemus sylvaticus sylvaticus* (L.).

Still plentiful at Blackheath, Greenwich Park and Marshes and open spaces further out in the Kentish sector (J. F. Burton, D. F. Owen).

BLACK RAT. *Rattus rattus* (L.).

See separate paper by J. Fisher on p. 136.

CHIPMUNK. *Tamias striatus* L.

E. Step ("Animal Life of the British Isles," 1921) stated that this American squirrel had "become acclimatised in the London area," but it must have died out again, as it does not appear to exist now, and there is no other reference to it in the literature.

[ROE DEER. *Capreolus capreolus*, ? subsp.

Epping Forest, Essex, a deer probably of this species was seen in the winter of 1946 (P. A. Colinvaux).]

REPTILIA.

[EUROPEAN POND TORTOISE. *Emys orbicularis* L

Canons Park lake, Edgware, Middx., a small tortoise possibly of this species, frequently seen basking on a raft of twigs and swimming in the summer and autumn of 1946, and said to be still there (P. A. Colinvaux).]

SLOW-WORM. *Anguis fragilis* L.

Lewisham, one in October 1949 (D. F. Owen).

AMPHIBIA.

COMMON NEWT. *Triturus vulgaris vulgaris* (L.).

Inner limit in S.E. London: Greenwich Park, Blackheath, Southend ponds, Kidbrooke, Lee, Lewisham; abundant at all localities (J. F. Burton, D. F. Owen).

PALMATE NEWT. *Triturus helveticus helveticus* (Razoumowsky).

Chislehurst, plentiful in pond in a garden in 1941-43; five in a small pool on Shooter's Hill Golf Course in 1947 (J. F. Burton).

Crested Newt. *Triturus palustris palustris* (L.).

Occurs at Lewisham (D. F. Owen) and in some numbers in a small pool on Shooter's Hill golf course in 1947 and 1948 (J. F. Burton).

Common Frog. *Rana temporaria temporaria* L.

Inner limit in S.E. London: Greenwich Marshes and Park, Blackheath, Lee, Lewisham (J. F. Burton).

The Black Rat, *Rattus rattus* (L), in London.

By James Fisher.

In most seaport towns of Britain the ship rat is confined to the docks and wharves and to the parts of the town not far away from them. In London, however, this species lives in a large area, particularly in the upper parts of large buildings. In some houses and blocks of offices or flats which are proofed at ground level it is the only rat. It can be found in many places up to three miles from the commercial waterside, and has been found breeding and established at greater distances. Certain fashionable flats, clubs, theatres and cinemas in the West End are infested, and are regularly visited by rat catchers and rodent officers. Ship rats are found in restaurants and hospitals; and many offices and shops have them, including some on Oxford Street and in the City. It is the dominant rat in the Oxford Street area. Parts of London which are still regularly "treated" for *R. rattus* infestations, and which have a resident population, probably independent of shipping and waterside traffic, include the Port, the City, and the boroughs of Westminster, Holborn, Finsbury, Stepney, Bermondsey, Southwark, Poplar, Deptford, Wandsworth, Fulham and Woolwich; and the species has also been recorded recently in Chelsea, St Marylebone, St Pancras, Walthamstow, Battersea, Shoreditch, Lambeth and Kensington; and in East and West Ham, Erith, Chiswick, Acton, Enfield, Epsom, Dagenham, Purfleet and Tilbury.

All colour forms are found, from the wholly blackish animal described as *R. r. rattus* through the brownish form *R. r. alexandrinus* to the light-bellied brown *R. r. frugivorus*. These live and breed freely together, and almost every intermediate form is known. The species should be regarded in Britain as polymorphic, and adherence to these subspecific names is of no particular value.

[This note was received too late for inclusion in R. S. R. Fitter's "Check-list of the Mammals of the London Area" in *The London Naturalist*, No. 28.—Ed.]

Reviews.

Film Strips. The Sedge Warbler, and The Purple Emperor. Educational Productions Ltd. 15/- each, with notes.

We have received for review two film strips produced by Educational Productions Ltd. These are intended primarily for use in schools, but are of interest to all naturalists.

The first of these, the Purple Emperor, shows in detail the life history of one of our largest and most attractive butterflies, explaining the reason for its name and showing the various stages in their natural habitats. The accompanying notes throw light not only on the activities of this particular butterfly, but also on the life of lepidoptera in general. Data and timing are given, also a distribution map.

The second strip, the Sedge Warbler, has notes written by Philip E. Brown. The photographs show details of the family life and habits of the Sedge Warbler. There are maps showing the area in Western Europe where they nest, and the probable area in Africa where they winter. In the introductory notes points of comparison and distinction between the Reed and Sedge Warblers are indicated. The photographs are well chosen and beautifully clear. Both these strips are suitable for classes of all ages.

H. F.

A Key to the British Fresh- and Brackish-Water Gastropods, with Notes on their Ecology. By T. T. Macan. Pp. 45, 15 figs. Freshwater Biological Association, Scientific Publication No. 13. 1949. 2/-.

This little publication is, indeed, wonderful value for the money and should form an ideal field handbook for the student of our water-snails. The delightful illustrations of about fifty species by R. Douglas Cooper, F.R.S.A., are among the finest we have seen; most are enlarged, but accompanied by a natural-size sketch. In addition to the key characters, the more important diagnostic features are summarised for each species. The nomenclature is up-to-date, following Ellis' *British Snails*, 1926, but with the latest valid name indicated, where necessary, in the synonomies. A few of the more important variations of *Lymnaea pereger* are figured and notes on modern taxonomic work given for some of the species.

"Notes on Ecology" form a very useful section of the work and, although based mainly on Boycott's classic work of 1936, have been modified from the author's experience in the Lake District. There is a short but useful list of references supplementing those in Ellis. The work fully maintains the high standard set by the previous Scientific Publications of the Association, which include keys to a number of groups of aquatic organisms, all published at remarkably low prices and obtainable from The Director, Wray Castle, Ambleside, Westmorland.

C. P. C.

	Barometer.			Temperature.										Rain.			Gales.	Thunder Storms.	Fog.
											Grass. Night Min.								
Month.	Max.	Min.	Avge.	Max.	Min.	Avge. Max.	Avge. Min.	Avge.	Avge. Daily Range.	Max. Range.	Max.	Min.	Avge.	Amt. in Inches.	No. of Rain Days.	No. of Wet Days.			No. of Days.
Jan.	30.80	28.50	30.60	53	25	47.45	36.10	41.77	11.35	28	45	22	35.80	0.92	13	7	2	—	6
Feb.	30.75	29.50	30.27	57	18	50.14	33.71	41.92	16.43	39	49	14	29.61	1.02	9	4	4	—	2
Mar.	30.55	29.70	30.10	68	25	49.09	33.80	41.44	15.29	43	43	21	30.77	0.85	7	3	2	—	1
Apr.	30.30	29.20	29.92	83	29	62.43	42.26	52.38	20.17	54	51	25	39.30	1.43	12	7	3	—	—
May	30.45	29.40	29.86	71	31	63.19	42.87	53.03	20.32	40	50	28	40.03	1.84	12	10	1	2	—
June	30.20	29.55	29.80	90	38	71.40	50.33	60.86	21.07	52	57	34	45.70	0.75	5	3	—	1	—
July	30.20	29.55	29.86	87	45	76.87	54.32	65.59	22.55	42	57	40	49.64	1.82	7	3	—	3	—
Aug.	30.35	29.10	29.84	88	43	75.45	53.26	64.35	22.19	45	60	39	48.80	0.98	5	5	2	1	2
Sept.	30.10	29.45	29.98	87	45	72.66	55.46	64.06	17.20	42	60	40	50.36	0.72	6	5	—	—	—
Oct.	30.60	29.15	29.97	77	28	61.77	45.97	53.87	15.80	49	60	25	42.06	4.75	14	13	3	1	7
Nov.	30.60	29.25	29.80	56	26	48.66	37.23	42.94	11.43	30	46	22	34.66	2.19	15	13	1	1	4
Dec.	30.55	29.45	29.96	55	27	47.42	37.84	42.63	9.58	28	47	23	35.45	1.55	15	9	3	—	2
														18.82	120	82	21	9	24

The Climate, 1949.

By H. HAWKINS.

(Observed at 119 Beresford Road, Chingford.)

GENERAL REMARKS.

THE winter months were mainly mild and dry. January had six days of fog. The temperatures in February and March were unusually high, and sunshine broke all records.

The Spring and Summer months were exceptionally fine; rainfall was well below average.

In September the days were warm and sunny, with high night temperatures.

October was the wettest and the foggiest month of the year, but remarkable as the night temperatures were very high.

November, unlike most of the recent months, was more or less normal, although the rainfall was below average.

A summary of the year's figures is given in the table. (For explanation see *Lond. Nat.*, No. 24, 1945, p. 36.)

Obituaries.

Professor M. Greenwood.

Professor Major Greenwood, D.Sc., F.R.C.P., F.R.S., who died on October 5th at the age of sixty-nine, joined our Society in 1899 when he was a first-year student at the London Hospital, and remained a loyal and active member whilst engaged in a career that covered a wonderful range and brought him the highest academic honours. A full account of this career is given in *Nature* of Nov. 7th and both there and in the professional journals tribute is paid to his statistical and epidemiological work, his literary and scholastic qualities, his fearless criticism of pretentiousness and pomposity, and his courage in the defence of the unpopular, whilst his exertions in helping those whose scientific conscience made impossible their submission to Nazism are justifiably emphasised.

A recurrent theme in these tributes is his respect for the amateur in science, a sentiment that strengthened, and was strengthened by, his connexion with this Society. In the *London Naturalist* for 1948 we are fortunate in having his address, as our Honorary President, on " The Debt of Natural Knowledge to the Amateur,'' followed by Mr Payne's address which draws freely upon Greenwood's account of the life of Arthur Bacot—an outstanding example of that debt.

Greenwood walked with the great and remained unimpressed by greatness, looking only at the man. He was a Londoner, born and brought up in the Hackney Road, and ready to say so when the interests of hard-up students in our University were discussed. He read many books in divers languages, had a wonderful memory always at command and a lively logic, but, failing to recognise how unusual were such gifts, he showed opposing trends in himself, being diffident and unduly humble about his own abilities whilst impatient with ignorance or stupidity in others when he had expected knowledge or understanding. Thus to some people he seemed a formidable academic personality, for his encyclopedic knowledge and sometimes caustic wit made him an opponent not to be lightly provoked. Others knew the sensitive man behind this mask and when he died there came regrets, not unexpected by those privileged to know him, from neighbours who, ignorant of his academic standing, found much to say about his good-fellowship and kindness.

We need not feel hurt because in all the references to his interests there is no mention of Greenwood's association with us. Rather should we be happy that he found here something to hold him to us for half a century, perhaps some of that recreation of body and mind which many of us surely find in this Society. My recollections go back to the time when Greenwood shared in the discussions that we youngsters staged about Weissmanism, about sexual selection, about whether vipers swallowed their young, or whatever else we could find to argue about. In 1901 he showed his mettle in a paper on " The quantitative theory of evolution; a new method of research " and ever since then few years have passed without his adding something to our literary records. Yet his papers show a notable limitation. All are bookish, often historical; none refers to observational work, and this limitation marks a curious limitation in Greenwood himself. Fond of the Forest, he knew it well and many of its characteristics, and anywhere out of doors he was always ready to be interested in the birds, the plants, and the insects; but spontaneous observation was not of his world. That, walking through the Forest, engaged with him in solving the international problems of the day, one could without effort notice a moth on a tree-trunk, had for him a dash of the miraculous. Arthur Bacot, on the other hand, was a gifted observer, and the differences between them made more impressive their friendship, the termination of which by Bacot's death from typhus in 1922 caused intense grief to Greenwood, a grief it was my sad privilege to share. I like to recall an early morning in the summer of 1917 when, on a short leave from France, I was able to join them in a walk through the Forest for a swim in the Wake Valley Pond. After our swim we sat by the pond in the sunshine and, through some freak of acoustics, could hear the rumble of the guns in Flanders. Thus reminded of the horrid mess of war, I felt as we talked that these two men embodied something sane in a world of unreason. The one was erudite, precise in speech, inept, we might even say inefficient, in any manual dexterity; the other was self-taught, pronounced words as he had read them, and in his middle age became a distinguished expert in laboratory technique. The bonds between them were intellectual honesty and a sense of obligation to their fellows, qualities that made smooth and easy their twenty years of collaboration.

This personal sketch may help us to picture his academic career. He qualified as M.R.C.S., L.R.C.P., in 1904, and stayed at the London as a demonstrator of physiology till 1910, also studying biometrics under Karl Pearson at University College. At this time, because of his conveniently small size, he was made the subject of pressure-chamber experiments that had a bearing upon the development of deep diving, a subject upon which I found him helpful when, in 1930, I had some association with it myself. In 1910 he became statistician to the Lister Institute, leaving it for the Ministry of Health in 1919. In 1928 he became Professor of Epidemiology at the London School of Hygiene and held that post till he retired in 1945. When he entered the field of medical statistics it was a new and poorly-esteemed subject; among his honours were the Guy Medal in silver and the Guy Medal in gold of the Royal Statistical Society, the Buchanan Medal of the Royal Society, various named lectureships, including the Herter at Baltimore and the Linacre at Oxford, and the fellowship of the Royal Society in 1928. These are a measure of the work he did in raising medical statistics to its present esteem.

Greenwood married in 1908, and the death of his wife in 1945 was a sad loss. He leaves two sons and two grandchildren.

M. C.

Miss G. Lister.

Miss Gulielma Lister died on May 18, 1949, at the age of 88. A member of a family associated with science for generations, Miss Lister was the embodiment of the best scientific spirit. She was an able botanist, and a great lover and keen observer of birds and mammals. Her outstanding interest was in the small group known as *Mycetozoa*. Her father, Mr Arthur Lister, F.R.S., made a profound study of these organisms, and prepared the British Museum publication, *A Monograph of the Mycetozoa*, in which work he had his daughter's assistance. The *Monograph* became the authoritative work on the group, and after her father's death Miss Lister brought out the second and third editions, each edition describing and illustrating new species. In her time Miss Lister was the world authority on the *Mycetozoa*, and received correspondence and specimens from the five continents.

Miss Lister joined the L.N.H.S. in 1927. Some years earlier she had lectured to the Society on the *Mycetozoa*, and had then exhibited active plasmodium under the microscope. On other occasions she gave valuable addresses to the Society and the Chingford Branch, and for some years helped at the Society's exhibitions.

Always intent on spreading the knowledge of the *Mycetozoa*, and in interesting others in the study and collection of these organisms, Miss Lister passed a life of continuous work with many hours spent at the microscope and in making coloured illustrations of minute specimens. Despite her reputation throughout the world and in circles where her accurate and painstaking work was appreciated, Miss Lister remained modest and kindly, and was very patient with those less gifted than herself. Many benefited from her help not only in her special interest, but in other branches of natural history, for in her active years she was as pleasant and helpful a companion on a bird excursion as at a fungus and " myxie " foray. She outlived many of her contemporaries, and to many present members of the L.N.H.S. was unknown or little known. One who for years had the advantage of her help wrote: " She was one of the world's great women "; but few knew her well enough to realise that her life was one of work and service.

J. R.

H. S. Stowell.

Hugh Spencer Stowell died at Plymouth on December 24th, 1949, having been a member of the Society for 30 years.

An architect by profession, with a wide knowledge of English mediaeval architecture, he joined the Society in 1920, becoming a very welcome and enthusiastic member of the Archaeological Section. Appointed Recorder in 1921 to the Section, he retained this office to 1928, during which period he edited a number of MSS. " Records " of buildings visited by the Section, all of which are to be found in our library.

In 1928 he published a handbook, *How to Look at Old Churches*, the success of which called for a second edition a few years later, the book being still in print.

Offered an important position at Plymouth in 1934, which he accepted, Stowell left London to reside there, greatly to the loss of his many friends and our Society.

His ability, helpfulness, and modesty, endeared him to his colleagues. He was a life member of the Society.

S. A., L. J. T.

Walter Augustus Wright.

With the passing on the 13th April 1949 of W. A. Wright the Society lost one of its most careful and painstaking ornithologists.

He was born at Hackney in 1876 and later lived at Walthamstow, where he took an active interest in tennis and cricket and excelled particularly at tennis. During the first World War he served as a special constable and later in the 2nd Battalion Queen's Westminsters with whom he saw service in both the Middle East and on the Western front. He was married at Brentford in 1920 to Margaret Laura Lambert, but unfortunately his married life lasted for less than seven years, his wife dying in 1927. On his marriage he removed to Chingford, in which parish he resided for the rest of his life.

With the loss of his wife he devoted rather more of his time to the study of natural history, and whilst it was as an ornithologist he was best known to the members of the Society he was no mean entomologist with a sound knowledge of the lepidoptera. He was also well versed in the study of trees and was deeply interested in roads, from ancient trackways to the modern motor road. He was a member of the Association of Bird Watchers and Wardens, now merged with the Royal Society for the Protection of Birds. By profession he was a jeweller with a comprehensive knowledge of precious stones, gems, hall marks and especially of jewellery fashions.

On the outbreak of the second World War Mr Wright joined the L.D.V., although considerably over age, and continued his voluntary service in the Home Guard until almost the end of the period of hostilities.

Despite his many activities in business, in natural history and in his Church and domestic affairs, Mr W. A. Wright found time to give a friendly helping hand in many ways. There are many members of this Society who will have cause to remember him for many kindnesses, performed unobtrusively but thoughtfully and just when they were most needed. For many years he devoted himself to the instruction of a party of children in the study of birdlife and bird calls and song, turning out at 7 a.m. each Sunday morning for this purpose in both winter and summer. The foundations so carefully laid have enabled most of the members of that party to build a first-class knowledge of birds.

In 1938 he was, despite his creed, compelled to take a short rest from his activities but after a short spell of idleness he resumed his ordinary round protesting that he was fit again. This was, however, one of the first signs of his disability, which slowly worsened, until his death in April 1949.

For a considerable number of years he acted as Reading Circle Secretary to the Ornithological Section and greatly helped to widen the number of subscribers. For a short time he also acted as Chairman of the Chingford Branch.

Walter Wright's enthusiasm for all his interests was infectious, but few will have attained the same degree of care and patience with which he verified and compiled his records. Despite all circumstances he was cheerful and optimistic and a veritable pillar of strength to all who looked to him for guidance or help.

B. T. W.

STATEMENT OF ACCOUNTS

GENERAL

Receipts.

1948			
	Subscriptions—		
£527 0 6	Current	£625 8 6	
87 10 6	Arrears	78 12 6	
13 12 6	In Advance	7 15 0	
19 5 0	Entrance Fees	20 0 0	
£647 8 6			£731 16 0
6 8 3	Interest on Post Office Account		7 13 6
2 12 6	Interest on £75 War Stock, 3½%		2 12 6
2 2 0	Donations		—
£658 11 3			£742 2 0
46 12 3	Balance, 1st November 1948		57 15 6
£705 3 6			£799 17 6

LONDON NATURALIST

£37 4 3	Sales of *London Naturalist*, *London Bird Report* and Reprints	£21 9 4
—	Advertisements in *London Bird Report*	3 1 0
48 0 0	Grant from the Royal Society	72 0 0
12 0 0	Donation	—
248 5 11	Balance to General Account	332 5 4
£345 10 2		£428 15 8

BOTANICAL RECORDS

Balance, 1st November 1948	£33 16 7
Interest on Post Office Account	0 16 6
	£34 13 1

LEGACIES

Legacy received, the late P. J. Hanson	£50 0 0	
Proceeds of Sale of Books, ex P. J. Hanson Bequest	7 0 0	
		£57 0 0
		£57 0 0

The Balances on Life Composition Account and Reserve Account remain at £285 and £90 respectively.

J. H. G. PETERKEN, Hon. Treasurer.

YEAR ENDED 31st OCTOBER 1949.

ACCOUNT.

1948	*Expenditure.*	
£94 0 0	Rent	£102 14 6
74 14 11	Syllabus Expenses (Printing and Postage)	93 6 10
24 18 8	Printing and Stationery	43 14 11
14 10 3	Postages—Secretary and Treasurer	21 0 11
2 16 10	Insurance	2 16 10
4 0 0	Gratuities	5 0 0
6 6 0	Subscriptions	5 5 0
28 3 7	Sectional Expenses	46 0 9
—	Donation—Nature Conservation Committee	2 0 0
6 9 7	Chingford Branch Expenses	4 2 0
0 16 1	Grant—"Birds of London Area"	0 19 7
71 0 0	Secretary's Honorarium	76 0 0
40 0 0	Library Expenses	20 0 0
—	Printing Map of Society's Area	18 4 1
—	Sundry Expenses	4 18 6
248 5 11	*London Naturalist* Account	332 5 4
1 1 0	Donation—Bookham Common Committee	—
8 7 6	Lecturers' Expenses	—
0 10 6	Curator's Expenses	—
18 7 1	Carriage, etc., re various Bequests	—
3 0 1	School Nature Study Union Exhibition	—
£647 8 0		£778 9 3
57 15 6	Balance, 31st October 1949	21 8 3
£705 3 6		£799 17 6

ACCOUNT.

£345 10 2	Printing and Postage—*London Naturalist* and *London Bird Report*	£428 15 8
£345 10 2		£428 15 8

ACCOUNT.

Balance, 31st October 1949	£34 13 1
	£34 13 1

ACCOUNT.

Cost of Additional Bookcase for the Library	£19 10 0
Balance, 31st October 1949	37 10 0
	£57 0 0

Audited and found correct.
9th January 1950.

E. B. BANGERTER, Auditor.
C. L. COLLENETTE, Auditor.

Official Reports for 1949.

Council's Report.

As forecast in our last Report, membership has exceeded one thousand in 1949, the total on 31st October being 1013; this is a net increase of 61 over the figure for 1948 and a continuation of the upward trend of the past six years. When one considers, however, that the Society's area must have a population of at least ten million, we have little ground for complacency and considerable scope for further recruitment.

Since our last Annual General Meeting, the Society has suffered two severe losses in the deaths of our late President, L. G. Payne, and our Honorary President, Professor M. Greenwood. We have also to record with regret the deaths of R. C. Cyriax, J. C. Eales-White, L. M. Emberson, Sir H. S. Gladstone, Miss M. Lee, Miss G. Lister, Miss M. E. Miller, A. G. Ratcliff and W. A. Wright. An obituary of Mr Payne appeared in the *London Naturalist* for 1948, and obituaries of Professor Greenwood, Miss Lister and W. A. Wright are being prepared.

To mark the election of our 1000th member, it was decided to invite five members of long standing to become Honorary Vice-Presidents. We are glad to announce that S. Austin, M. Culpin, Oliver G. Pike, J. A. Simes and L. J. Tremayne, all of whom have been members for over 50 years and have done much to give the Society the good name it now enjoys, have accepted our invitation. H. J. Burkill and W. C. Cocksedge were appointed Vice-Presidents to fill two vacancies that occurred since our last Annual General Meeting.

During the year H. J. Burkill has retired from the post of Minuting Secretary after 30 years' service, and has been succeeded by Miss M. Kennedy. Miss B. Knott has taken E. A. Round's place as Secretary of the Chingford Branch. To Mr Burkill and Mr Round the Council offer their sincere thanks for the good work they have done while serving in these capacities.

Although the Plant Galls Section has decided to cease functioning as a Section, we feel sure that the small band of enthusiasts who have done so much valuable work in the past will still continue with this work under the wing of the Entomological Section, to which they were welcomed at the Sectional General Meeting.

Through our Librarian, the Science Museum Photostat Service is now available to members: photographic copies of a 20-page publication cost two shillings.

The Nature Conservation Committee, to which reference was made in our last Report, is now functioning, under the Chairmanship of Miss Longfield, with C. P. Castell as Secretary. The importance of this Committee is greatly enhanced by the fact that it is recognised as the authority for dealing with Nature Conservation matters in the

London Area by the Nature Conservancy, inaugurated by the Government this year, with Captain C. Diver, C.B.E., as Director-General. From the use that has already been made of this Committee by local planning authorities in our area, it is clearly meeting a vital need: to all members we would stress the help that this Committee still requires.

We have to thank R. H. Ryall and his " Sales Team " for starting a new service for members: through their efforts our publications are now on show and can be bought at all indoor meetings.

This year we increased the number of evenings on which the library is open to members, by booking rooms at the London School of Hygiene for informal " Library and Collection " meetings on some evenings when no formal meetings are being held. These meetings have proved most popular.

Librarian's Report.

The Library has been widely used by members in spite of the fact that so many meetings are not held at Keppel Street, and the special Library and Collection evenings have been well attended.

The purchase of an additional bookcase has enabled us to assimilate the P. J. Hanson Bequest and progress is being made with further rearrangement to make the books and journals in the Library more readily accessible. It is proposed to issue duplicated library lists on a Sectional basis and the first of these will be ready shortly.

As a memorial to the late Mr L. G. Payne five volumes of the works of J. H. Fabre and *The Life of Fabre* by his son have been presented to the Library, and each book contains a suitable inscription made by Mr Baker.

New books have from time to time been added to the Library by gift and purchase. The binding of periodicals is now being kept up-to-date.

In conclusion I should like again to express to the Sectional Librarians my thanks for their valuable help.

R. W. HALE.

Chingford Branch Report.

This year, Chingford Branch held eight indoor meetings and eleven field meetings. The lectures were interesting and various. Mr E. E. Syms gave a talk on " The Life Histories of Some Common Beetles." Mr Martin, the secretary of the local Antiquarian Society, spoke about " Chingford Through The Centuries." Three members, Messrs Peterken, Ward and Pinniger, read short papers on " Spiders," " Poplar Trees," and " The Disappearance of Certain Butterflies from Epping Forest." Mr E. A. Round gave a talk on " London's Countryside," with script and illustrations kindly loaned by the London Transport Board.

Unfortunately Mr Wright, through illness, was unable to give his lecture on " Songs and Calls of Waders," so Mr E. T. Nicholson read his script, and this was illustrated with gramophone records. There was a talk by Mr J. Brimble, a well-known Chingford photographer, on " The Amateur Photographer." Mr Pinniger read a short paper on " British Dragonflies," and Mr E. T. Nicholson on " Common Birds to be seen on the Walthamstow Reservoirs." Mr K. E. Hoy completed the year with a lecture on " The Flight and Speed of Birds."

There were two special field meetings. In March the members were shown round the Queen Elizabeth Hunting Lodge Museum by Mr B. T. Ward, the curator. And in October, Mr E. T. Nicholson conducted a party round the Walthamstow Reservoirs.

Mr E. A. Round resigned from the post of secretary, and Miss B. B. Knott took over his office. Four new members were enrolled and one country associate.

The Branch has suffered a great loss in Mr Wright, whose obituary notice appears elsewhere.

B. B. Knott, *Branch Secretary.*

Sectional Reports.

Archaeological Section.

Indoor Meetings. One General and two Sectional meetings were held during the year. On February 1st Mr E. A. Round gave an illustrated talk, entitled " An Introduction to Architecture." In this the lecturer explained the evolution of the various styles of building, as exemplified in outstanding British fabrics. " A Talk About Windmills " was delivered by Mr W. C. Cocksedge on April 26th. A widely representative selection of slides illustrated this lecture, in which Mr Cocksedge laid stress on the different types of mill. On November 22nd Mr J. Seymour Lindsay gave a lecture on " Some Examples in London of the Blacksmith's Art," in which he traced the evolution of style in wrought-iron work, and explained some of the intricacies of its manufacture. Some beautiful slides illustrated the lecture.

Outdoor Meetings. Twelve well supported meetings were held during the year, and in some cases attendances were high. The important and beautiful treasure recovered from the Sutton Hoo burial, and on exhibition at the British Museum, was shown and explained by Mr J. E. S. Dallas on January 29th. A large party attended the Sir John Soane Museum on February 26th, when Mr J. Summerson explained its history and principal contents. Another large party attended Westminster Abbey on March 26th, where the Muniment Room was visited under the guidance of Mr L. E. Tanner, F.S.A. The rurally situated Broxbourne Church was visited on April 23rd, under the leadership of Mr S. Austin. Mr Dallas arranged the outing to Slyfield Manor on May 14th, the owner of which, Miss Rowan Hamilton, kindly took the party round and gave an outline of the building's history. On June

11th Mr W. C. Cocksedge took a party into Kent, to inspect the interesting old churches of Shoreham and Otford. A return visit to the West Drayton district was made on July 23rd, under the leadership of Mr V. G. Howlett. The churches at West Drayton and Harmondsworth and the Tithe Barn at the latter place were visited. On August 28th Mr W. Mackintosh led a party to the Box Hill area and explained something of the archaeology of the Dorking Gap, with emphasis on the courses of the so-called Pilgrims' Way and Stane Street in the Gap. The course of the Tyburn Stream was followed on September 24th, under the guidance of Councillor Miss E. Bright Ashford, LL.B., who also gave an account of the place of the stream in the life of bygone London. On October 22nd Brentford Museum was visited, when Miss F. M. Green, F.L.A., explained to the party the important archaeological collections housed therein. Mr W. G. Teagle took a party to Stone Church on November 19th, and gave an account of its structure and history. Several members of the London and Middlesex Archaeological Society joined in on this occasion. The churches of St Andrew Undershaft and St Helen's were visited on December 10th, under the leadership of Mr H. G. Singleton, who explained their chief features of interest.

Reading Circle. There are 18 subscribers, and two copies of *Antiquity* are in circulation. In has been proposed that the *Archaeological News Letter* be taken for the Reading Circle, in addition to *Antiquity.*

General. Section membership is 95. Reciprocal arrangements have been established with the London and Middlesex Archaeological Society, whereby members of either society are invited to attend certain outings of the other.

W. C. COCKSEDGE, *Chairman.* W. MACKINTOSH, *Acting Secretary.*

Botanical Section.

Membership. The membership of the section again shows a slight increase, being now 224 as compared with 217 last year.

Officers. During the year Mr E. B. Bangerter has undertaken the duties of representative on the Syllabus and Publications Committees.

Indoor Meetings. At a general meeting in February, Dr R. W. Butcher gave an interesting talk on "Life and Death in a River," which dealt with his research into the effects of water pollution in the Trent basin. Maps and slides were shown, and the methods used in obtaining the results were fully described. In May, at a sectional meeting, Dr W. R. Philipson read a paper on "Plant Hormones," which stimulated a good discussion and many questions. An exhibition was held in June, at which a number of members presented material. A paper was read by Mr H. Spooner, describing the origin, history and probable future of our hedgerow systems, with notes on their composition and ecology.

Field Meetings. Since the beginning of the year 12 meetings have taken place, with an average attendance of 12. Two meetings have been devoted to Bryophytes, one at Ruislip and the other at Hackhurst. At the former was found *Dicranum montanum* Hedw. and *D. flagellare* Hedw. One excursion was made for fungi in the Leatherhead district, and despite the dry weather 30 species were noted. Other localities yielding interesting plants included Box Hill (*Viola calcarea* Greg., *Cynoglossum montanum* Roth., *Ophioglossum vulgatum* L.), Benfleet to Leigh (*Dianthus armeria* L., *Vicia bithynica* L., *Tragopogon porrifolius* L.), Black Park, Iver (*Carex laevigata* Sm., *Blechnum spicant* With.), Grays chalk pits (*Pyrola rotundifolia* L., *Medicago sylvestris* Fries.).

Collections. The curator reports that the herbarium is in good order. A number of sheets from the Bishop collection have been included during the year.

Library. Our librarian, with the help of Messrs E. B. Bangerter, R. A. Boniface and A. H. Norkett, has now completed a catalogue of the library. A card index has been prepared of the 250 botanical items available. Volumes from the Bishop library have been incorporated. and duplicate copies sold to members and others. The sum raised, approximately £15, has been devoted mainly to binding volumes of the *Journal of Botany.* Ten volumes of the *Journal* have been presented to the Society by Mr G. R. A. Short, and 15 were included from the Bishop library. Our collection is now complete from Vol. 27 (1889) to Vol. 80 (1942), when publication ceased, and it undoubtedly forms an important part of the section's library.

Botanical Records. The publication of records is now being considered by the Committee. The best form of presentation has not yet been decided, but it is hoped that a useful list will be printed in the course of a year or two.

General. The Botanical Committee feel that the policy of the section should be to encourage more individual work by members. Useful work can be done by any member who is prepared to make the effort, and help and advice will always be given by the more experienced. Examples of the type of work now required are: (a) reports and floristic descriptions of all areas scheduled as possible nature reserves; (b) complete floristic lists of definite districts within the London Area; (c) records and lists of Bryophytes and Fungi; and (d) intensive studies of individual species, including life history and distribution. Exhibitions will be held periodically, and all members with work to show will be given the opportunity of doing so. Short papers on any original botanical work are especially encouraged, and the Secretary should be notified when any are complete or approaching completion.

D. H. KENT, *Chairman.* F. E. WRIGHTON, *Secretary.*

Ecological Section.

Membership of the Section increased slightly and now stands at 186. The Section was responsible for arranging lectures at four General Meetings. Lectures were given by Dr M. Burton on " Life by the Seashore " on March 15th, and by Mr A. G. Leutscher on " Lives and Habits of British Reptiles and Amphibians " on March 29th. On June 7th, Mr J. D. Hillaby and his fellow-workers of the Hampstead Scientific Society contributed a series of short papers on " Hampstead Heath —a Preliminary Study on an Enclosed Area." Prof. H. Munro Fox lectured on " Animal Waters and the Peculiarities of their Animal Life " on Nov. 1st.

Three Sectional Meetings were held; Mr F. E. Wrighton contributed a paper on the " City Bombed Site Vegetation " on Nov. 30th, 1948; Mr A. E. Ellis lectured on " British Land and Fresh-water Snails " on Jan. 25th, and on Sept. 27th short papers on " Recent Work at Bookham " were contributed by Col. Bensley and Messrs Castell, Currie and Norkett.

The official monthly meetings at Bookham were attended by an average of 12 members, but in addition, many visits were made to the Common by members on other occasions for survey purposes.

A field excursion to Box Hill on March 6th was led by Mr C. C. Fagg, F.G.S., who also showed members the work of the Juniper Hall Field Centre. Members were the guests of the Hampstead Scientific Society on June 11th, when their survey work at Hampstead Heath was demonstrated in the field. On Sept. 18th, Mr F. Rose demonstrated Salt Marsh Ecology at Upnor Marshes. On one of the official Bookham Common Survey visits on Oct. 9th, Dr J. F. Hayward and members of the Geological Section demonstrated the use of the auger in soil investigation. The monthly Saturday afternoon visits to the City Bombed sites have been continued during the months April to October under the leadership of Messrs Currie and Wrighton.

The Reading Circles continue in a flourishing condition with 38 subscribers.

G. Beven, *Chairman.* C. P. Castell, *Secretary.*

Entomological Section.

The year under review was not entirely a satisfactory one for the Section. Despite the persistently good weather, attendances at field meetings were poor, and in some cases hardly warranted the trouble taken to organise the excursions. We must appeal to our members for more support if the Section is to continue an active existence.

For the first time since the war, a circular was prepared covering the programme for July-December, and sent to all members at the end of June. It is too early yet to assess the results of this venture, but the committee have decided to issue similar circulars for next year (1950).

Five indoor meetings were held during the period covered by this report. On 16th November 1948 Baron de Worms gave an illustrated talk entitled " A Review of British Butterflies ", in which he described life-histories and paid special attention to local races. On 8th February Mr C. Garrett-Jones spoke about the recent attempt to eradicate mosquitoes in Sardinia. His talk, which was illustrated with lantern slides, was entitled " New Methods against Mosquitoes: the Experiment in Sardinia and its Entomological Significance." On 3rd May Mr G. E. J. Nixon gave a talk on " Some Aspects of Insect Social Life," with particular reference to bees. An evening devoted entirely to exhibits and short notes by members on 13th September proved once again very successful, 12 members contributing notes. On 18th October Dr Easton gave an interesting talk on methods of collecting Coleoptera: unfortunately attendance at this meeting was very poor. Attendance at sectional indoor meetings averaged 22.

A note of all the sectional meetings has for some time been sent to one or other of the monthly entomological journals, so that our activities are made known very widely. It is proposed in future also to send notes of entomological general meetings.

Ten field meetings were held during the year. On 1st May Mr Weal led an excursion to Ongar Park Wood: amongst the Coleoptera taken were *Feronia cuprea* (L.), *Dromius agilis* (F.), *Quedius maurus* (Sahl.), *Gabrius splendidulus* (Grav.), *Epuraea melanocephala* (Marsh.), *Rhizophagus depressus* (F.), *Cryptophagus affinis* Sturm., *Asemum striatum* (L.), *Caenorhinus germanicus* (Herbst.), and *Rhynchaenus salicis* (L.). On 7th May Mr Shillito led an excursion to Epping Forest, where the breeding-place of the mosquito *Orthopodomyia pulchripalpis* (Rond.) was observed. On 15th May Mr D. F. Owen was the leader at Darenth Wood, when amongst other insects a Pearl-bordered Fritillary with white hindwings was taken.

On 19th June the Section combined with the botanists of the Society in a coach excursion to Matley Bog in the New Forest, under the leadership of Mr Colyer. Weather was indifferent, but the following insects were seen:—Odonata: *Ceriagrion tenellum* (de Villers); Coleoptera: *Agonum mulleri* (Herbst), *Thymalus limbatus* (F.), *Anaclyptus mysticus* (L.), *Tomoxia biguttata* (Gyll.), *Cryptocephalus labiatus* (L.), *Cyphon padi* (L.), *C. ochraceus* Steph., *Agathidium nigrinum* Sturm., *Calvia 14-guttata* (L.), *Malthodes dispar* (Germ.), *Galerucella lineola* (F.), *Ennearthron affine* (Gyll.), *Triplex aenea* (Schaller), *Gabrius splendidulus* (Grav.), *Rhynchaenus iota* (F.), *Elater pomonae* Steph., *Leptura scutellata* F., *Onthophagus fracticornis* (Preys.), *Corymbetes siaelandicus* (Mueller) and *Feronia oblongopunctata* (F.).

On 25th June Mr Keywood led an excursion to Arbrook Common. *Chrysomela tremula* F. was amongst the Coleoptera taken. On 9th July Mr Burton led to Eynsford and Shoreham, where the following butterflies were seen *inter alia*:—*P. aegeria*, *E. semele*, *A. paphia*, *A. aglaja*, *P. c-album* and var. *hutchinsoni*, *L. camilla* and *L. coridon*. On 17th July Mr Harry Britten led an excursion to a very interesting area near Old Coulsdon, where a number of Trypetidae were taken.

On 7th August Mr Garrett-Jones was the leader at Broxbourne. Coleoptera taken included *Prionus coriarius* (L.), *Cetonia aurata* (L.), *Dorcus parallelipipedus* (L.), *Melandrya caraboides* (L.) and *Bembidion dentellum* (Thun.). On 4th September Mr Parmenter led an excursion to Tilgate Forest, where the following were amongst the insects seen:—Lepidoptera: *Colias croceus* (Geoff.); Odonata: *Aeshna juncea* (L.), *Erythromma naias* (Hausemann); Hemiptera: *Graphocephala coccinea* (Forster); Coleoptera: *Strangalia quadrifasciata* (L.). On 16th October Mr Forster was the leader at Epping Forest. Amongst the Coleoptera taken were *Quedius ventralis* (Arag.) and *Philonthus subuliformis* (Grav.).

The average attendance at field meetings (excluding the Matley Bog joint excursion) was 5½.

Our thanks are due to all those who sent in lists of captures and observations to the secretary; it is hoped that members attending field meetings will continue to do so, in order that records of the fauna of the areas visited may be built up. The Section can materially help the work of the Nature Conservation Committee here, as it is your committee's policy to arrange as many field meetings in "conservation areas" as possible.

We regret to have to record the deaths of three members, Major J. C. Eales-White, Miss M. E. Miller and Mr L. G. Payne.

Total membership of the Section is now 144, an increase of 9 since last year's A.G.M. This is the sixth year in succession in which our membership has shown an increase.

Twenty-three members belong to the Section's reading-circles, which circulate *The Entomologist*, *Entomologist's Monthly Magazine*, and *Entomologist's Record*.

Work is proceeding on the library, but we are hampered by lack of a librarian, and at present your secretary is endeavouring to combine the two jobs.

Re-arrangement of the collections is continuing. A large number of specimens has been added during the year, including many species not hitherto represented. The following members and friends are thanked for their donations: Messrs F. D. Buck (Col., Dipt., Hym.), P. W. E. Currie (Odon.), D. Leston (Hym.), E. B. Pinniger (Col., Lep.), and R. D. Weal (Col., Hem.).

Work is continuing on the entomological surveys, and Baron de Worms' paper on the Lepidoptera of the London Area appears in this issue.

CYNTHIA LONGFIELD, *Chairman*. R. M. PAYNE, *Secretary*.

Geological Section.

Progress has been maintained by the section in all directions. Membership has increased to 72. Attendance at field meetings has averaged 19 and at indoor meetings 30. Four lectures were arranged by the section and 19 field meetings (including five museum visits) were held.

Among the eminent geologists from outside the Society who lectured at indoor meetings was Mr E. Ernest S. Brown, President of the Geologists' Association, whose subject was "Recording of Temporary Geological Sections." Museum demonstrations included "Fishes of the Past" by H. A. Toombs, and "William Smith and the Birth of Modern Geology" by Dr L. R. Cox. A visit was made to the Kempton Park Water Works (by kind permission of the Metropolitan Water Board) in the early spring, and in the late summer a party of 20 members visited the works of Messrs Le Grand, Sutcliffe and Gell Ltd. (Well Drillers) at Southall where much of interest was displayed notably an actual boring in progress in the grounds.

Other field meetings included a joint meeting with the Ecology Section to Bookham Common where Dr Hayward gave a demonstration (assisted by others) on the use of the auger in the study of surface geology. A motor coach was used on two occasions, a visit to the Pliocene Crags of East Anglia under the direction of Mr W. S. Pitcher when the Society was joined by a party from the Imperial College of Science, and a visit with the West Middlesex and South Bucks Scientific Society to places along the Thames Valley to study the River terrace under the joint direction of Miss C. E. Cannon and Mr P. Evans.

The experiment of holding a long field meeting at Easter met with considerable success. A party of 12, with headquarters at Newport, Isle of Wight, carried out excursions to places of geological interest throughout the island over a period of five days. The meeting under the guidance of Mr R. E. Butler was thoroughly enjoyed by all present and a large number of specimens was collected.

A committee was formed in March to investigate temporary geological sections within the Society's area. Good progress has been made and a report by the Recorder is appended. The first collection of reports appears elsewhere in this volume.

The thanks of the section are due to those geologists who so willingly conducted meetings and to the owners of quarries and works for permitting the Society to visit their properties.

Geological Reserves. The Recorder reports that the Bucks County Council has instructed local Rural Councils to preserve recommended pits and sections in the County.

Exact sites of geological reserves have been marked on 2½ inches to a mile Ordnance Survey maps and copies sent to the Herts County Council at their request.

The London County Council have been notified by the Ministry of Town and Country Planning that pits at Kenwood (Bagshot Sand) and at Charlton (Lower London Tertiaries) are scheduled as National Geological Monuments and that the Ministry must be consulted before any development plans for the pits may be put into operation.

Temporary Geological Sections. Since the formation of the Committee for temporary geological sections in March a number of members have been actively engaged in investigating excavations within the Society's area—mainly in Central London. Ten major reports have been received besides a number of smaller ones.

JOHN F. HAYWARD, *Chairman.* B. AINSLEY, *Secretary.*

Ornithological Section.

Membership. During the year there was a further increase in membership and the total reached was 696, made up of 616 Full Members, 56 Country Associates, 7 School and 14 Branch Associates and 3 Affiliated Societies.

Lectures. Eleven indoor meetings were held, the Section having arranged lectures at three General Meetings. These were as follows:—General—Mr Peter Scott, " Wild Geese on the Severn "; Messrs George Edwards and Eric Hosking, Films of traps and trapping methods and of the reaction of birds to stuffed dummies; Major Anthony Buxton, " Cock Capercailzie in Display: Roe in their ' Rings,' etc." Sectional—Mr R. E. Moreau, " The Breeding Seasons of Tropical Birds "; Mr Kenneth Williamson, " The Fair Isle Observatory "; Mr Derek Goodwin, " Some Aspects of Bird Life in Egypt and Eastern Libya "; Dr Stuart Smith, " Scientific Aspects of Bird Migration "; Mr E. H. Gillham, " The Identification of Duck "; Short Papers by Members—Mr W. G. Teagle, " A Week on the May "; Mr M. D. England, " This Hide Business "; Mr E. R. Parrinder, " A Holiday in the Camargue," and Mr C. B. Ashby, " Notes on Field Identification "; Mr S. Cramp, " First Report on the Swifts, Swallows and House-Martins Enquiry "; Mr R. W. Hayman, " Photographs and Skins from our own Collections." Discussion on the Work of the Section.

Personnel. During the year Mr E. R. Parrinder succeeded Mr R. C. Homes as Chairman of the Section and Mr L. Baker became Assistant Secretary in place of Mr C. J. Duffin. Mr G. E. Manser followed Mr H. F. Greenfield as Recorder for South of the Thames and Dr W. R. Philipson succeeded Mr W. G. Teagle as Recorder for North of the Thames. Miss E. M. Goom became Reading Circles Secretary and Mr C. Hughes Field Meetings Secretary in place of Mr H. O. Jones.

Dr G. Beven, Mr S. Cramp and Mr R. C. Homes joined the Committee in place of Mr E. R. Parrinder, Mr P. W. E. Currie and Mr D. A. T. Morgan.

We record with great regret the death of Mr W. A. Wright, by which the Section suffers a severe loss. Mr Wright was a member of the Committee for many years and his cheerful presence and wise counsel will be sadly missed. An obituary notice appears elsewhere in this issue.

Publications. Field List Cards. Most of the 5075 cards originally printed have now been sold, and it is hoped to make arrangements for a further supply to be reprinted.

Exhibition. The Section accepted an invitation from The Royal Society for the Protection of Birds to take part in their Jubilee Exhibition, held at the Central Hall, Westminster, from March 30th until April 2nd, 1949. The Section's stand, which was designed by Mr L. Baker, showed three aspects of the Section's work in the London Area:—Winter Population of Duck; Ringing Recoveries of Black-headed Gulls; and A Census of Great Crested Grebes.

Field Meetings. Fifty-one field meetings were held, with an average attendance of 18. Coach trips have remained popular, 55 members attending the expedition to Mersea Island on February 27th.

Among notable birds seen were five Kentish plovers at Rye in August and a pair of hobbies at King George VI Reservoir in September. A stone-curlew's nest with two eggs was found on Ewelme Down in June.

Reading Circles and Book Fund. Expansion of the Reading Circles has been maintained and there are now 14 copies of *British Birds* in circulation, the number of subscribers being 118. There are also two copies of *The Scottish Naturalist* and one each of the American journals *Auk* and *Bird Banding.* It is hoped to start a circle for *The Ibis* if sufficient support is forthcoming.

Library. The ornithological section of the library continues to flourish and the number of books has been considerably increased by presentation, the bequest of the late Mr P. J. Hanson and by purchase; the total, which includes 50 county histories, now reaches 212 works. A new bookcase has been installed and cataloguing has been completed, a card index of titles being available to members

It is hoped, shortly, to have a handlist for sale also.

Curator's Report. During the past twelve months 51 specimens were added to the skin collection. They included a sparrow-hawk from Combe Hill, Kingston, presented by Mr D. A. Rawlence, a kittiwake from Minehead presented by Miss N. Goom and a set of 49 skins, some of which are of species not previously represented in our collection.

Unfortunately the largest of these, such as some gulls, skuas and geese, cannot yet be added owing to lack of space.

Mr C. A. White has made good progress in the rearrangement and cataloguing of the egg collection. Three cabinets containing the Society's and Nicholson's collections have been completed, the Hanson collection sorted and catalogued, the Sladen collection sorted, and it now remains for a comprehensive index to be prepared.

Members are reminded that photographs of typical bird habitats in the Society's area are still required.

Ringing. Bird-ringing figures for the 1948/49 season have shown a substantial increase over those of the previous year and 31 ringers have sent in records. Altogether 923 birds, of 62 species, have been ringed—as against 615 birds of 60 species in the previous year.

Twenty-eight recoveries have been notified by the British Trust for Ornithology; black-headed gulls ringed by Mr T. L. Bartlett have, as usual, provided a number of these. A gull ringed in St James's Park in November 1946 was recovered two years later at Gravesend and another ringed in January 1947 was found at Corby, Northants, in January 1949. A very notable recovery was that of a blackbird ringed as a nestling on May 13th, 1945, by Mr J. A. Wigzell at Wimbledon, which was found at Brest, in Western France, on January 25th, 1949. Only two other British-ringed blackbirds have ever been recovered abroad and both of these, also ringed as nestlings, were recovered in the same area of Western France.

Two starlings ringed at the roost in Trafalgar Square were recovered in the outer suburbs. The ringing of roosting starlings is being considerably expanded and members may be able to provide invaluable confirmatory evidence by trapping and ringing starlings in their gardens and by ringing nestlings.

Field Work. As in previous years, a complete census was made of the herons, great crested grebes, black redstarts and little ringed plovers within the area and the winter duck census work was continued. An enquiry into the number and distribution of Swifts, Swallows and House-martins was launched and successful counts made in four sample areas. The survey of the bird-life at selected gravel pits was continued for a second year.

Another new enquiry started was that into the roosting habits of London's starlings; this enquiry originated with a small group of members catching and ringing starlings in Trafalgar Square but it is being extended to cover the plotting of all known roosts in the built-up areas and of the fly-lines to them and, for the first time, regular counts are being made at the roosts.

Recording. Full details of recording activities are given in the *London Bird Report,* published separately, which contains some important papers by members as well as the annual summary of the more interesting and important bird-occurrences during the year.

Birds of the London Area, 1900-1950. Work on the projected history of the birds of our area has reached an advanced stage, but detailed lists, especially of breeding species, are still needed for many parts of our area to fill up the quite extensive gaps in our knowledge.

E. R. Parrinder, *Chairman.* W. D. Melluish, *Secretary.*

Ramblers' Section.

The membership of the section is about 70.

Five visits were arranged to places of general interest, and the numbers attending averaged out to twenty-three. Visits were made to Dr Johnson's House, Gough Square; Kemsley House to see the printing of a newspaper; Chiswick House and grounds, the house unfortunately being closed to the public for restoration; one of the United Dairies Processing Depôts; and to the oldest Bell Foundry in the country, situated in Whitechapel Road, which dates back to 1570.

Eight out-of-door excursions were arranged, with an average attendance of twelve. The districts visited were Polesden Lacey House and grounds; Epping Forest; Chipstead (which was a joint ramble with the British Empire Naturalists' Association); Greenwich Park; the Royal Horticultural Society's Gardens at Wisley; Wormley Wood (which was a joint ramble with the Botanical section); Colley Hill; and a week-end walk from Eastbourne to Alfriston, where the night was spent, finishing up at Lewes the next day. In addition to our own members, visitors from the British Council were present at three of our rambles: 7 came to Epping Forest, 6 came to Chiswick House, 9 came to Greenwich Park. We wish to thank all the leaders of these excursions.

An indoor sectional meeting at the Art Workers' Guild Hall took place on the 29th November, when Mr E. V. Watson, Ph.D., F.Z.S., gave a talk on "A Naturalist in America," which was attended by fifty-one members.

The *Journal for the Commons, Open Spaces and Footpaths Preservation Society* has been circulated to the Reading Circle.

The section had a balance of cash in hand of 8s 11d at the end of the financial year.

H. Spooner, *Chairman.* F. E. Johns, *Secretary.*

Additions to List of Members

(From 1st October 1949 to 4th July 1950.)

Members:

1950 Acheson, E. D., 173 Hendon Way, N.W.2. (Orn.)
1950 Allain, A. M., Alderton Hall, Loughton, Essex. (Bot., Ecol., Ent., Orn.)
1950 Armitage, Miss R., 15 Bedford Way, W.C.1. (Orn.)
1950 Baker, M. F. B., 24 Bramshill Gardens, N.W.5. (Orn.)
1950 Ballance, Miss E. R., Herringswell, Shaw Crescent, Sanderstead, Surrey. (Orn.)
1949 Bartlet, A. W., 35 The Knoll, Hayes, Bromley, Kent. (Orn.)
1949 Bennett, Miss M. E., 11 Larkfield Road, Richmond, Surrey. (Bot., Orn.)
1949 Betts, A. H., 143 Crofton Road, Orpington, Kent. (Orn.)
1950 Booth, J. B., 18 Lancaster Gate, W.2.
1950 Brown, D. A., 63 Montagu Road, Hendon, N.W.4. (Orn.)
1949 Burton, M., D.Sc., F.L.S., British Museum (Natural History), Cromwell Road, S.W.7.
1950 Carr, D., Home Mead, Monks Road, Virginia Water, Surrey. (Orn.)
1950 Champtaloup, Miss A. Y., B.A., M.B.E., 2 Gordon Square, W.C.1. (Orn.)
1950 Cliff, H. J., 102 Church Road, Richmond, Surrey. (Orn.)
1950 Cloudsley-Thompson, Dr J. L., M.A., F.R.E.S., F.Z.S., 10 Lower Green Road, Esher, Surrey. (Arch., Ecol., Ent.)
1950 Cobban, Miss A., 11 Westbourne Park Road, W.2. (Bot., Orn.)
1950 Cooke, Miss S., 2 The Pryors, East Heath Road, Hampstead, N.W.3. (Orn.)
1950 Cross, J. J., 71A Warwick Road, S.W.5. (Orn.)
1950 Cross, Mrs J. J., 71A Warwick Road, S.W.5. (Orn.)
1950 Dobson, Miss V., at 6 Wellesley Crescent, Strawberry Hill, Twickenham. Middx. (Orn.)
1950 Eckenstein, Miss H., 14 Grove Gardens, Park Road, N.W.8. (Arch.)
1950 Edwards, Mrs L. B., 4 Bandon Rise, Wallington, Surrey. (Orn.)
1950 Ellis, F. W., 38 Coniston Gardens, South Kenton, Wembley, Middx. (Orn.)
1949 Farrand, J., 58 Westbere Road, N.W.2. (Orn.)
1950 Fenner, M. L., 54 Heybridge Avenue, Streatham, S.W.16. (Ent.)
1949 Flaxman, E. W., "Kingswood," Derby Road, East Sheen, S.W.14. (Orn.)
1945 Foster, Miss K. E., 40 Bishopric Court, Horsham, Sussex. (Bot., Ecol.)
1950 Fraser, Professor Sir Francis R., M.D., F.R.C.P., 2 Gordon Square, W.C.1.
1950 Furze, Brigadier E. K. B., D.S.O., O.B.E., M.C., 55 Stanhope Gardens, South Kensington, S.W.7. (Orn.)
1949 Garrett, E. W. A., 84 Langdale Road, Thornton Heath, Surrey. (Orn.)
1950 Gibbs, A. A., 11 Sinclair Road, West Kensington, W.14. (Orn.)
1950 Gibson, F. B., 189 Cannon Lane, Pinner, Middx. (Geol., Orn., R.)

1950 Goode, F. C., 19 Maythorne Close, Watford, Herts. (Orn.)
1950 Groves, E. W., 143 Carshalton Park Road, Carshalton, Surrey. (Bot., Ecol.)
1950 Hammond, A. E. F., 79 Conway Road, Southgate, N.14. (Bot., Ent., Freshwater life, Orn.)
1950 Hood, Miss D. H., 36 Eton Avenue, N.W.3. (Arch.)
1950 Hosking, E., 20 Crouch Hall Road, N.8. (Orn.)
1950 Howe, Miss R. M., 17 Hall Place Gardens, St Albans, Herts. (Orn.)
1950 Hyam, Miss H. M., 65 Hillfield Road, Hampstead, N.W.6. (Orn.)
1950 Johnson, Miss M., 368 Whitefoot Lane, Bromley, Kent. (Geol.)
1950 Jones, F. H., 28 Jordan Road, Greenford, Middx. (Orn.)
1950 Jones, Miss P. M. S., 101 Talcarne Drive, Pinner, Middx. (Arch., Orn.)
1949 Kellett, Mrs F. G., 613 Royal Palace Hotel, W.8. (Bot., Conch., Geol.)
1949 Kellett, Miss S., 613 Royal Palace Hotel W.8.
1950 King, J., 78 Oakhill Crescent, Woodford Green, Essex. (Ent.)
1950 Knock, R. H., 3 Holmbury Court, Upper Tooting Road, S.W.17. (Orn.)
1950 Leach, J. C., 5 Morley Crescent West, Stanmore, Middx. (Orn.)
1950 Leake, Miss D. A., 51 Eton Avenue, N.W.3. (Orn.)
1950 Lindsey, D. B., 37 Warren Road, Leyton, E.10. (Ent., Zoo.)
1950 Macgregor, Miss M. C., 11 St George's Road, St Margarets, Middx. (Orn.)
1950 Marsh, B. A., 19 Grasmere Avenue, Kingston Vale, S.W.15. (Orn.)
1950 Martin, A. E., M.D., Heatherlea, 5 Whitepost Hill, Redhill, Surrey. (Arch., Bot.)
1950 Mathews, Miss M. L., 73 Elm Grove Road, Barnes, S.W.13. (Orn.)
1949 Matthews, G. A., 5 Orchard Avenue, Upper Belvedere, Kent. (Ecol.)
1950 Mayall, R. G., M.B., M.R.C.S., L.R.C.P., 70 Cleveland Road, Ealing, W.13. (Orn.)
1950 Miles, W. J., 5 Sylvan Way, West Wickham, Kent. (Bot., Ecol., Geol., Prehistory, Zoo.)
1949 Milne, B. S., 6 Raleigh Avenue, Wallington, Surrey. (Orn.)
1950 Moffat, Miss J. M., 23 Blackheath Park, Blackheath, S.E.3. (Biol., Orn.)
1949 Mourant, Miss E., 23 Twyford Avenue, Acton Hill, W.3. (Bot., Orn.)
1950 Moynihan, M., 20 Craven Terrace, Lancaster Gate, W.2.
1950 Newman, B. H., 59 Davis Road, Acton, W.3. (Orn.)
1949 Owen, J. E., 3 Lockmead Road, Lewisham, S.E.13. (Bot., Ecol., Ent., Palaeontology.)
1950 Owens, O. F., 12 Roland Gardens, S.W.7. (Bot., Orn.)
1950 Palmer, Miss J., 16 Lyttelton Court, Lyttelton Road, N.2. (Orn.)
1950 Palmer, K. H., Cold Blow House, Bexley, Kent. (Orn.)
1950 Petrie, Miss B., 52 St Stephens Gardens, Bayswater, W.2. (Orn.)
1950 Price, Miss C. H., 27 Highgate West Hill, N.6. (Arch., Orn.)
1950 Pugh, Miss M. E., 14 Daleham Gardens, Hampstead, N.W.3. (Orn.)
1950 Reese, Surgeon Commander J. M., R.N., c/o Lloyds Bank Ltd., 263 Tottenham Court Road, W.1. (Orn.)
1950 Richardson, P., 1 Capthorne Avenue, Harrow, Middx. (Orn.)
1949 Rignall, J. N. A., 1 Cyril Mansions, Prince of Wales Drive, Battersea Park, S.W.11. (Orn.)
1950 Routledge, Miss B., 9 Lancaster Drive, Hampstead, N.W.3. (Orn.)
1950 Rule, A. W., 203 High Road, Tottenham, N.15. (Bot., Ent., Geol., Orn.)
1950 Rule, Mrs M. H., 203 High Road, Tottenham, N.15. (Arch., Geol.)
1949 Sabin, Miss D. M., 27 Langbourne Avenue, N.6. (Orn.)
1950 Sabin, Miss E. F., 27 Langbourne Avenue, N.6 (Orn.)
1950 Sartoris, Miss E., 17 Neville Street, S.W.7. (Orn.)
1950 Savage, J. F., " The Mount," South Hill Avenue, Harrow-on-the-Hill, Middx. (Arch., Geol., R.)
1950 Sedergreen, Miss R. C., 15 York Street Chambers, York Street, W.1. (Bot., Orn.)
1949 Sheppard, Prof. P. A., B.Sc., F.Inst.P., 43 Alexandra Road, Hounslow, Middx.
1950 Simons, Miss B. M., 16 Waldemar Mansions, Fulham, S.W.6.
1950 Slade, W., Woodsome Lodge, St George's Avenue, Weybridge, Surrey. (Orn.)

1949 Small, Mrs L. M. P., 13 Woodfield Crescent, W.5. (Bot.)
1950 Spence, G. J., 4 Ashford House, High Street, Wimbledon, S.W.19. (Bot., Orn.)
1950 Stride, P. F., 56 Gade Avenue, Watford, Herts. (Orn.)
1950 Stromberg, Miss E. I., 28 Hollingbourne Gardens, Ealing, W.13. (Orn.)
1950 Taylor, B., 44 Bradbourne Street, Fulham, S.W.6. (Arch., Geol., Mollusca.)
1949 Taylor, Miss S. K., Templeton, Priory Lane, S.W.15. (Orn.)
1950 Teasdale, Miss M., 317 Wanstead Park Road, Ilford, Essex. (Bot., Orn.)
1950 Thompson, Dr Mary C., 16 Elmwood Road, Herne Hill, S.E.24. (Bot., esp. Flowering Plants.)
1950 Thorneycroft, Rev. K. H., M.A., St Mark's Vicarage, 13 North Audley Street, W.1.
1950 Tooth, G. C., "Arncliffe," Radlett, Herts. (Orn.)
1950 Wade, Miss M. G., Hopkinson House, 88 Vauxhall Bridge Road, S.W.1. (Bot., Orn.)
1950 Wain, Miss M. E., Hopkinson House, 88 Vauxhall Bridge Road, S.W.1. (Bot., Orn.)
1949 Wallace, D. I. M., 10 Newcastle House, Luxborough Street, W.1. (Orn.)
1950 Wallis, Miss I., 14 Kensington Court, W.8. (Orn.)
1950 Waters, S., 40 Ashburnham Mansions, Ashburnham Road, S.W.10. (Orn.)
1950 Welch, A. J., 97 Harrowdene Road, Wembley, Middx. (Geol.)
1950 West, K. H., 117 Mayplace Road East, Barnehurst, Kent. (Orn.)
1950 Wheeler, A. S., "Courtside," 21 Shelvers Way, Tadworth, Surrey. (Lep.)
1950 Whiddington, Miss P. J. J., 18 Buckingham Street, W.C.2. (Orn.)
1949 Wilks, Miss V. M., 63 Harrow View, Harrow, Middx. (Arch., Bot.)
1950 Woods, Miss T. C., 50 Makepeace Mansions, Highgate, N.6. (Orn.)

Affiliated Societies:

1950 Maria Assumpta Training College, 23 Kensington Square, W.8. (Representative Member: Dr Hella Czech.)

Branch Associates:

1950 Hopkinson, A., 31 Elmfield Road, North Chingford, E.4. (Orn.)
1950 Wright, R. H., 232 Croxted Road, S.E.24. (Orn.)

Country Associates:

1949 Chandler, Miss E. A., Little Gaterounds, Newdigate, Surrey. (Ecol.)
1950 Davies, A. E., 49 Highfield Road, Kidderminster, Worcs.
1949 Harvey, J. P., 86 Lenton Boulevard, Nottingham. (Orn.)
1949 Jewell, A. L., "Chota Ghar," Highbury Grove, Haslemere, Surrey. (Ecol., Micr.)
1950 Kemp, E. T. W., 23 Redstone Manor, Redhill, Surrey. (Orn.)
1949 Lander, Miss J., 27 Clevedon Road, Newport, Mon. (Ecol., Orn.)
1949 Rhodes, F., Cobb Cottage, Bowsey Hill, Kiln Green, Twyford, Berks. (Ecol., Ent., Orn.)
1950 Thacker, D. M. D., 34A High Street, Leigh-on-Sea, Essex. (Arch.)
1950 Whybrow, C., M.A., LL.B., F.R.G.S., "Appledore," Montague Road, Berkhamsted, Herts. (Orn.)

School Associates:

1950 Benbow, Miss R M., 61 Teevan Road, Addiscombe, Croydon, Surrey. (Orn.)
1950 Brown, J. W., 62 Fairway, Carshalton Beeches, Surrey. (Orn.)
1949 Farrand, Master R. J., 58 Westbere Road, N.W.2. (Orn.)
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Thysanoptera of The London Area.

(LONDON THRIPS).

Part I.

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Introduction.

Thysanoptera, commonly called Thrips, have received scant attention from entomologists. This may be attributed to the small size of the insects (0.4-6 mm. long for British species), lack of brilliant colouration or bizarre shapes, or economic importance of the majority of species, the need for a microscope of low magnifying power to mount and of a higher power to classify the insects. Nevertheless, the order is clearly recognisable, numerous in specimens and species, most of which can be identified with practice by the naked eye in the field. It offers a huge field for research: new locality and county records can be discovered very easily; species new to Britain or even to science may be found quite readily, particularly in the southern half of England; the life-histories and host-plants of many species await discovery. It draws the student into the open at all seasons of the year, for whilst the largest number of species is found during sunny, warm days in April-September, some occur throughout the year on or under their host plants and may be taken during the hardest frosts, and others may be collected off fungi in rain.

This paper deals particularly with the species already found or thought likely to occur in the London Area of which the centre is St Paul's Cathedral and the circumference a circle of 20 miles radius, the area covered by the London Natural History Society and mapped by Fitter (1945).* In it an attempt is made to enable any person interested in insects to recognise the adults of most of the British species. The anatomical characters described will apply to the order to let the reader have an idea of the range of variation, but the classification will apply particularly to British species and will exclude families not represented in Britain. Keys to the larvae and other immature stages will not be included, as they would make the paper very long and would require much illustration. Notes will be given on the habits and life histories of many of the species, the time when the various instars may be found, the likely habitat of each instar, the food (when known) of each species, the distribution in London, Britain and abroad.

The paper is based largely on my unpublished work on Thysanoptera, carried on during the last 25 years in various parts of Britain. I have also had experience of collecting and naming many species from abroad. My collection of 54 species from the London Area includes some thousands of specimens gathered in about 240 hours on 111 occasions during 14 years from 1922-1946. I spent most of 1923 in London studying the insects, but since then my collections and observations in London have been limited to brief visits, as I have lived 500 miles away, mostly in Aberdeen. Unfortunately there are very few other records of Thysanoptera from the Area.

London does not lack thrips. On plants growing on the blitzed sites almost within the shadow of St Paul's ten species were found within an hour; on straggling weeds growing against the walls of Smithfield

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*See also map in *The London Bird Report* for 1936 (1937).

Market in winter three species were taken; on weeds and grass trampled by the Sunday crowd of people in St James's Park four species were found in ten minutes; on grass and weeds in the grounds of the British Museum (Natural History) 15 species were taken in an hour; 15 species were also found on herbage in Hyde Park. These are by no means all the species that could be found in each locality mentioned. In the average suburban garden 20-30 species may be found in the year. The numbers increase considerably with the varied habitats enclosed in Greater London's vast circle. The total is probably about 150. About 180 species have been recorded from Britain.

Collection and Examination.

For examination alive, Thrips may be gathered and confined with the flowers, fungi, etc., they haunt, in insect-proof bags of paper, cellophane or cloth. If they are too active to examine on the plant under the microscope, they may be enclosed in a transparent receptacle of glass or other composition. For general collection they may be gathered straight off the plants or off a sheet of stiff paper on to which they have fallen as a result of tapping the plant sharply whilst holding the paper below it. A fern trowel about 12 inches long, which can be carried in a sheath on a belt at one's waist or placed in a pocket of one's jacket, proves invaluable in tapping plants and in stripping fungi off bark. By means of a finely tipped, small paint-brush or a slender flowering stem of grass moistened in alcohol each specimen is picked off the paper and transferred to dilute alcohol in a glass tube. A convenient size of glass tube is 2 in. long, $\frac{1}{3}$ in. internal diameter, stoppered with rubber or with a cork steeped in paraffin wax. A dozen or more tubes should be carried, each filled with a mixture of 50 per cent. methyl alcohol and 0.5 per cent. by volume ethyl acetate for rapid killing of the insects. The thrips from each species of plant or other object should be collected in a tube by themselves. Also the specimens from each locality should be kept separate. The tube should be labelled with the finding place of the insect(s), i.e. a plant species or other object, locality, date, and a record of the capture should be written in the field note-book.

Preservation. The alcohol-ethyl acetate mixture macerates and makes adults comparatively easy to spread out in the mountant, but it is not suitable for preserving specimens for more than a few days at the usual room temperature. To preserve the insects in a good condition in a liquid medium, they should be transferred to a fair volume of 80 per cent. ethyl alcohol in a large tube with an airtight stopper. They should be stored in the dark.

Apparatus. Thrips are most conveniently mounted under suitable magnification of a binocular (Greenough) microscope which shows an upright picture, but they may be mounted under a lens or low power of a compound microscope provided with a porro prism to obtain an upright image. The mounted insects are examined under appropriate magnifications of a compound microscope which gives an inverted image unless it has an apparatus for reversing the picture. A micrometer eyepiece is needed and its divisions should be standardized in microns (1 micron = 0.001 mm.). All the tools required for mounting are a pair of finely pointed, straight, entomological forceps, used chiefly for placing the cover slip on top of the mounted insect, a small finely pointed paintbrush to transfer the thrips from one medium to another, two very slender rustless steel entomological pins (No. 0056/10) fixed in adjustable metal holders and used for arranging the antennae, legs and wings in the mountant. A pair of aplanatic lenses (×10 and ×20) in a metal mount are very useful in the field for spotting diagnostic characters in living and tubed insects.

Illumination. To judge the colouration of a thrips the most satisfactory light is probably daylight reflected from a white cloud, but electric light has many conveniences. Thrips should be examined by transmitted and reflected day and artificial light. Reflected colours should be judged by placing a piece of white and then of black paper under the slide bearing the insect illuminated by a beam passing through a condenser. If suitable electric light is available high-power dark ground illumination will show up hairs which would otherwise be invisible on opaque insects.

Measurements are useful in the description of thrips. The unit employed is the millimeter, or more frequently the micron (1/1000 or 0.001 mm.). Measurements should be based on sclerites and parts of the body not liable to distortion. As a fair variation exists between individuals of a species and there may be difference in size between the corresponding segments of either antenna or the forewings, measurements should be used with reasonable caution. The head length is measured from the anterior margin of the eyes to the base, and if the head is produced in front of the eyes, this should be described with measurements. The abdomen may expand fairly considerably in three dimensions. The expansion is obvious in living Tubulifera bearing large eggs.

Mounting. Thrips are mounted with the dorsal side up and with the antennae, legs and wings spread out (cf. Fig 1). Some of the same species may be mounted upside down or sideways to show characters better seen in these positions. It is best to mount a single specimen on each slide which should be labelled with the genus and species; the name of the author of the species; the sex of the adult or the name of the immature instar; finding place, which is usually a plant species; locality where found; mountant; name of collector; date of capture. It is convenient to place the insect across the centre of the slide and to have a uniform method of sticking on and writing label(s) in relation to the position of the insect.

Mountants. Immediately after being killed or at a later period the thrips may be examined in various temporary mountants like water, dilute alcohol or glycerine, glycerine jelly, Faure's fluid or Swan's (1936) modification of Berlese's medium, or it may be carried through the various stages to permanent mounting in Euparal, canada balsam or Sira mountant. Most specimens are transparent enough not to need bleaching or maceration to show skeletal details. The criteria I adopt for a permanent mountant are: the colours are not removed from an insect at any stage from capture to and including final mount; there is no distortion of the skeleton; the refractive index enables the observer to distinguish all cuticular structures, including colourless sensory organs of the antennae; preserves the insect without structural changes for an indefinitely long period of years; no loss of colour if stored in darkness; the slides are easy to store. The mountant I have found to comply best with these criteria during the last 20 years is Sira mountant, supplied by most dealers in microscope materials and made by Stafford Allen and Sons, London.

Summary of a Method of Permanent Mounting.

1. Collect in 50 per cent. methyl alcohol plus 0.5 per cent. ethyl acetate.
2. Store in 80 per cent. ethyl alcohol or dehydrate in absolute ethyl alcohol 1-6 hours in small corked tube.
3. Into a flat-bottomed glass receptacle of about 10 ml. capacity, which can be made airtight by lid, pour a few drops xylene and add the alcohol with its content of thrips from the tube. After 10-30 minutes add xylene to about a quarter of the volume of the mixture. Leave for 30 minutes.
4. Use paint-brush to transfer thrips to pure xylene in a small receptacle. They will become clear in 5-20 minutes.
5. Mount in Sira mountant, spreading wings, etc.
6. Label. There is no need to ring the mountant.

Actually very little alcohol and xylene is used up or wasted, and with airtight receptacles the mixtures can be used over again frequently.

Note-Keeping. In a group like the Thysanoptera in which so much has yet to be discovered, the student should keep notes written in the field and supplemented after further study. A small loose-leaf notebook serves for the field and two larger ones for the indoor notes. The field notes of each excursion should include date, G.M. Time, locality, soil type, herbage type, e.g. roadside plants, weather during the time of collecting. If temperature and relative humidity at different levels and at different times can be noted so much the better, but this will probably be impossible with most entomologists. However, wind direction and velocity can be recorded on the Beaufort scale with reasonable accuracy after a little practice and differences in light, like sun or shade, can be noted. The thrips from each species of plant or other finding place should be collected and bagged or tubed and notes made on their numbers, sex, habits, appearance to the naked eye, enemies, associated animals, plant species, location of thrips on plant, type and extent of injury, etc. More than one species and one sex of one and the other sex of a different species may occur in numbers especially in flowers.

The principal record incorporates the named species with the field notes against each. It contains the date, locality, etc., of each expedition and the alphabetical list of the genera and species with the data from the specimens of the species in each of the tubes. Thus: Amongst the captures of thrips from ten species of plants in a single locality, *Aeolothrips fasciatus* (L.) occurred on three species of plants and was placed in three tubes, and the record reads "*Aeolothrips fasciatus* (L.) 4 ♀♀, *Senecio jacobaea* flowers, very active in sunlight; 1 ♂ *Filipendula ulmaria*; $\overset{M}{2}$ ♀♀, $\overset{M}{1}$ ♂, $\overset{M}{3}$ I, $\overset{M}{4}$ II *Vicia cracca*, of these I II killed 1 ♀ *Thrips fuscipennis*." It is convenient to mark with an M over the number the specimens that are permanently mounted.

The third record deals with each species and is compiled from the second. Its numbers of vertical columns vary with the species, being most numerous in those with macropterous, hemi-macropterous, micropterous and apterous individuals of both sexes. An example is shown below.

Haplothrips juncorum Bagnall.

♀♀	♂♂	Eggs.	I.	II.	PP.	PI.	PII.	Finding Place.	Locality.	Date.	Remarks.
$\overset{M}{3}$				$\overset{M}{4}$				*Juncus effusus*	Epping, Essex.	3.9.1936	

Anatomy.

Cuticle. The head capsule of the adult is without sutures (Figs. 1, 3, 12) but these are clearly seen between the sclerites in the segments of the thorax and abdomen (Figs. 1, 2, 4). The surface of the cuticle is almost invariably marked with circular or polygonal anastomosing striae which may be so minute as to need oblique lighting to be seen; but the striae may form conspicuous ridges anastomosing and covering few plates in *Thrips* and many in *Heliothrips* and its allies. In *Sericothrips* and related genera the cuticle bears surface reticulation and is coated in many parts with very minute hair-like processes (microtrichia) which give the dry insect a silky appearance. The cuticle between the segments and sclerites is delicate and pale coloured but may be marked by dark spots or reticulations.

The cuticle of certain parts of the head and thorax is turned in to form bars or plates (apodemes), which usually show as darker regions through the transparent body wall. Portions of the abdominal sclerites may be thickened.

Chaetotaxy. A *hair* (seta, chaeta, macrotrichium) is an outgrowth of the cuticle that is connected with it by means of a membranous joint and is probably derived from a single trichogenous cell. Its apex is usually pointed, but may be lancet-shaped, truncate, knobbed, funnel-shaped, grooved and somewhat feathery. Certain hairs probably have a sensory function and they come very close in external structure to some of the sensory organs. A *bristle* is a hair that is particularly stout and rigid. A *cilium* is a long hair of almost uniform diameter. A *microtrichium* is a minute hairlike process of the cuticle without a membranous joint. A *spine* is an outgrowth of the cuticle of multicellular origin and without a joint. All these cuticular processes are generally coloured like the integument to which they are attached.

In most species the major regions of the body bear some hairs and a few bristles. The long bristles at the apex of the abdomen in Thripids and the short bristles on their hind tibiae are used for cleaning the wings and arranging the wing cilia. Certain S-shaped bristles on the abdominal tergites of Phlaeothripids (Fig. 12) seem to be associated with the resting wings and are more strongly developed in macropterous than in apterous individuals of a species. Some of the bristles on the thorax seem to be used to judge the height and width of narrow crevices into which the thrips has crept. The function of most of the hairs is unknown. Microtrichia (Fig. 11 B) coat the upper and lower surfaces of the wings of Terebrantia (except Merothripidae), are present on the basal segments of the antennae of many species, and cover much of the body of *Sericothrips* and related genera. A row of them forms the " comb " (Figs. 1, 5) along the posterior margin of the 8th abdominal tergite in many Thripids, and they may be developed on other segments. There are all degrees of transition between microtrichia and spines. Cilia fringe the entire wing in Phlaeothripidae (Fig. 12) and the posterior margins in Terebrantia (except Mymarothripidae) (Figs. 1, 9, 11 b, 12). Each has a joint and socket in Terebrantia, but is inserted directly between the two membranes of the wing in Tubulifera.

Coloration. The coloration of the insect is used in classification. It is determined by various physical and chemical causes, which are not the same for all parts of the insect, so that a chemical like dilute alcohol will extract colour from one and not from another part of the body. It is usually judged and described from the specimen cleared and mounted for microscopic examination, and this appearance is not the same as that of the living thrips examined in air. Nevertheless, it is the nearest approximation for practical purposes. In the absence of a universally adopted colour chart, the various shades of colour are described in fairly general terms.

Coloration is judged from mature adults. Females are usually larger and darker than males. Adults on emerging from the pupa are pale, becoming darker with age and the hardening of the integument. Hibernating females become very dark. Depending on the species and the sex, coloration varies from very pale to dark yellow or orange to various shades of brown, grey or black. Red or orange internal coloration is frequent. Strongly contrasted bands or spots of colour are rare on the body. The wings are colourless or shades of grey or brown or, more rarely, banded or striped with colourless (appearing white when dry) and dark coloured areas. Legs are coloured like the body or uniformly darker or lighter or variegated. The coloration is built up of the complex of colours from the integument, sub-hypodermis, and other soft tissues of the body. It may be divided into structural or physical colours, pigmentary or chemical colours and a combination of physico-chemical colours. Structural coloration of the cuticle produces purple metallic colours in at least one (non-British) species, the silky appearance of *Sericothrips*, the general glossy appearance of living insects and it may be responsible for white patches on certain species.

Most of the cuticle is pigmented. Unpigmented areas are transparent or they appear white through structural coloration. The colours are shades of yellow, brown or grey and they vary with the species and sex and are generally the most conspicuous in the insect and the most liable to become darker with age. Sub-hypodermal coloration is a crimson, scarlet or yellow pigment which generally occurs also in the larvae and pupae. The function and chemical composition of most of the pigments is unknown. According to Klocke (1926) a phaeomelanin colours the oesophagus, testes and receptaculum seminis. Schmidt (1929) deals with subhypodermal coloration. From examination of the pigment in adults and immature instars of some species I suspect that in these species a yellow or orange pigment may turn red. The individuals of a species show a difference in the intensity of red coloration. Red coloration is particularly common in Phlaeothripidae, common in Aeolothripidae and scarcer in Thripidae. In some species the green or dark contents of the alimentary canal can be seen through the body wall; in the Phlaeothripidae the coloured malpighian tubes and their contents are often conspicuous; the spermotheca and the vesiculae seminales are yellowish brown. A combination of physico-chemical colours occurs on many parts of the body and is usually better seen on the living than on the dead mounted insect.

The Head Capsule (Figs. 1, 3, 9, 12) (Petersen 1916) is variable in shape and is prolonged downwards and backwards, passing into the mouth-cone which ends between the fore coxae or further backwards, depending on the species. The antennae are inserted close together in front of the head and below the vertex, the eyes on the sides and the 3 ocelli between or in front of the eyes, with the anterior ocellus forming the apex of the ocellar triangle. The chaetotaxy is used in classification.

Eyes vary in size, depending on the species. In some species they vary in size in correlation with the degree of development of the wings, being smallest when the wings are reduced or absent. They appear black and have a reddish or purplish pigment. The facets number from three to some hundreds. They may be contiguous or separated, equal or unequal in size. Hairs may be numerous, scanty or absent between the facets.

Ocelli are present in macropterous insects, reduced or absent when the wings are not developed. The ocellar crescents are red, yellow or brownish, depending on the species.

Antennae 4-9-segmented (Fig. 10) are usually not much longer than the combined lengths of head and prothorax; segments are usually moniliform, somewhat laterally compressed, but some may be expanded in processes. Depending on the species, segments 3-7 bear sensory organs which are colourless and *trichoid* or hair-like, or *basiconic*, which are more or less elongated immobile cones or ribbon-like tympanic areas. Antennal structure, chaetotaxy, sense-organs, colour much used in classification. Last one or three segments (Fig. 1) in Thripidae form the "style."

Mouth parts. The mouth-cone (Fig. 3) is formed by the labrum, maxillae and labium (Reyne 1927). On the left side between labrum and maxilla lies the mandible. The right mandible becomes fused with the wall of the head during development. The shape of the mandible is not quite the same in Terebrantia and Tubulifera, but in both it is a cylindrical boring organ. Each maxilla consists of a stylet and a portion bearing a palp and forming part of the mouth-cone. In the Terebrantia the stylets are used for piercing and sucking, and in certain Tubulifera they are broadened and hooked together and used for feeding on fungus spores. The labium consists of a submentum and mentum—the latter bearing the palps. The apex of the mouth-cone is applied to the surface of the plant and the mandible and two maxillary stylets are extruded. The apex of the labrum in some Tubulifera is elongated, pointed and rigid and it perhaps helps in abrading the plant. The labium bears at its base a pointed hypopharynx, closely applied and forming with the labium a narrow median pharyngeal canal which opens into the pharynx.

The neck is of delicate cuticle, which allows the head to move upwards and backwards and slightly sideways.

Thorax. The prothorax is well developed, with pronotum clearly separated from head and mesothorax. The pronotum may be produced in processes laterally and it generally bears characteristic bristles. The meso- and meta-thorax are closely joined and they may be reduced in size corresponding with the reduction or absence of wings. The metathorax underlies the base of the abdomen so that the third pair of legs lies under the second abdominal segment (Figs. 1, 9, 12).

Legs. Three pairs, well developed; the first pair is often much enlarged in Tubulifera, being largest in the males. The femur and tibia may be armed with claws and hooks. The second pair of legs is the least subject to modification, the third pair is generally the longest and its tibia may bear a row of bristles used for cleaning the wings and the side of the body. The tarsus is two-segmented, except in some Tubulifera, which have one-segmented fore tarsi A protrusible bladder at the end of each tarsus is highly characteristic. It enables the insect to adhere to slippery surfaces. A pair of tarsal claws is absent in most Terebrantia, but a single lateral claw is present in some species. A pair of claws is developed in many Tubulifera. The first tarsal segment may bear a tooth or hook on its ventral surface. A hook (Fig. 11 A) on the second tarsal segment of Aeolothripidae is used as an antenna cleaner, and it is said to be used for opening the cocoon for emergence. Adults of certain species of Terebrantia are capable of jumping about 1 cm. high. The jump is often used as a preliminary to flight. As Hood remarked, the only morphological indication that a species is capable of jumping seems to lie in the posterior coxae being more closely placed than in an allied non-jumping species.

Wings. It is convenient to use the terms *macropterous* for thrips with fully developed wings, *hemimacropterous* for those with wings intermediate between full development and scale size, *micropterous* for those with scale wings, and *apterous* for those without wings. The fore pair of wings (Figs. 1, 9, 12) is little larger, stronger and darker than the hind pair. Each wing has a small posterior expansion, often scale-like, of its base. The wings are rather widely separated and there is a mechanism of hairs and folds that presumably keep the basal parts more or less locked together in flight. The resting wings in the Terebrantia lie flat on the back, side by side with the first pair over the second, in the Tubulifera they lie curved towards the apices. Overlapping is most pronounced in the Tubulifera and almost absent in some Terebrantia. The fringing cilia are folded below the wings. Depending on the species, wings may be present in both sexes, or present in females and not in males, or there may be different degrees of reduction in each sex.

Venation is much reduced. The wings are largest and bear most veins in the generalised families. Cross veins occur only in generalised families. The hindwing bears only one long vein. The long veins of the forewings of Terebrantia are usually marked by hairs on the dorsal surface. The arrangement and length of hairs and cilia is characteristic of each species, though subject to variation in macropterous individuals, and more so when the wings are more or less reduced.

The Abdomen is ten-segmented with traces of a terminal eleventh segment (Figs. 1, 2, 4, 5, 11 C), attached by broad base to metathorax and tapering to apex with or without an expansion about the middle, generally without ornament, but with sharp pointed or blunt processes on some segments in certain species. According to de Gryse and Treherne (1924) the "tube" of Tubulifera (Fig. 12) consists of the fused tergites X and XI and sternite XI. The males of many Thripids have glandular tympanic areas on sternites III-VII (Fig. 2). The chaetotaxy is regular. An arrangement of micropores occurs on the dorsal surface.

External Genitalia. The ovipositor (Figs. 4, 5) is well developed in the Terebrantia and consists of four blades between the eighth and ninth abdominal segments. It usually lies retracted below abdominal segments VIII-XI. It is absent in the Tubulifera, in which the ventral sclerites of the eighth and ninth abdominal segments are expanded into delicate margins that unfold and help to guide the egg during oviposition. In the males of both suborders there is an intromittant genital apparatus (De Gryse & Treherne 1924), rather weakly sclerotised, colourless or coloured. It varies with the species and is not homologous in both suborders. It opens in the phallus between the ninth and tenth abdominal segments in front of and ventral to the anus, and it lies in the ninth segment partly below the ninth tergite and the tergites and sternites of abdominal segments X, XI (Figs. 2, 11 C). The genitalia are of little or no use in specific determination. In the Terebrantia they are extruded upwards, apparently from the end of the abdomen, but in the Tubulifera they are extruded from the ventral surface of abdominal segment IX.

Sexual Dimorphism. Except in some very dark Tubulifera the sex can generally be distinguished easily by the naked eye in the field. With certain species of Tubulifera sexual dimorphism is complicated by the considerable range of variation in each sex, e.g. *Hoplothrips pedicularius* (Hal.), *H. ulmi* (Fabr.). In most species the sexes are so alike that there is no difficulty in assigning them to the same species; exceptions are *Taeniothrips ericae* (Hal.) ♀♀ dark brown, macropterous, ♂♂ orange, apterous, *Platythrips tunicatus* (Hal.) ♀♀ dark brown, macropterous or apterous, ♂♂ pale yellow, apterous, micropterous, *Rhopalandrothrips consociatus* (Tar. Tozz.) ♀♀ brown, ♂♂ yellow with very long sixth antennal segment. Females are usually larger and darker than males and in the Terebrantia the differences lie in the terminal abdominal segments and in the genitalia (Figs. 1, 2, 4, 5, 11 C), whilst in the Tubulifera the female generally has the antennal segment III shorter, the 1st pair of legs thinner and less strongly armed, a pair of long bristles occupies the place of a pair of short bristles on abdominal segment IX, the genitalia are different and a short, dark median rod lies ventrally in front of the genital invagination.

Gynandromorphs or specimens in which male and female parts develop simultaneously side by side, due to an incorrect distribution of the sex-chromosomes in the cells of certain tissues, are rare. I have found them only in *Oxythrips ajugae* Uzel and there are no published records of their occurrence in other species.

Deformities are most frequently shown by the antennal segments by reduction or coalescence. They are rare in the head capsule, single median antenna, legs, wings, abdominal segments and genitalia.

The Nervous System is largely concentrated in ganglia in the head, thorax and first two abdominal segments. From it nerves pass to the various regions of the body. Sense organs are eyes, ocelli, sensory hairs (trichomes) or cones or tympanic areas on the antennae, sensory hairs on the maxillary and labial palps, possibly various hairs and bristles on the body, possibly the peritremes of the spiracles, a row of pores on the fore trochanter of some Tubulifera, the circular area on the upper surface of antennal segment II of Tubulifera.

The Alimentary Canal (cf. Klocke 1926, Sharga 1933) consists of three regions, fore, mid and hind gut, of which the first and last are lined internally by a delicate chitinous cuticle. In the Terebrantia the foregut includes the pharynx attached by muscles to the walls of the head and serving to draw in food and pass it along the narrow tubular oesophagus that leads through the thorax to the abdomen where it is expanded into a crop that opens into the midgut or stomach. The stomach is a tube which varies in shape depending on the species of thrips and the quantity of contents. It passes backwards then curves forwards and then back again. At the hind end it passes into the hind gut and at the junction the four malpighian tubes open into the alimentary canal. The hind gut is short, divided into ilium, separated by a muscular constriction from the rectum, which is more or less expanded and contains 4-5 glands in its walls. The rectum opens to the exterior in the anus. Two or three pairs of glands lie in the head or body, and as their secretions enter the anterior end of the pharynx on the ventral surface, they are generally called salivary glands, but the function of their secretions has not been studied. In the Tubulifera the alimentary canal is similar, but the oesophagus is shorter, the stomach starts in the mesothorax, is shorter and less coiled back on itself, and the hind gut is long and wide.

The Excretory Organs consist of 4 malpighian tubes opening into the alimentary canal as described above. The walls are coloured in many Tubulifera. Under certain conditions of microscopic preparation the tubes are seen to contain spherical masses of uric acid crystals. When thrips have been kept for a long time in dilute alcohol or glycerine, crystals may be deposited in other parts of the body, spoiling the appearance of the mounted insect.

Reproductive Organs. Female Terebrantia have a pair of ovaries each composed of 4 ovarioles grouped more or less in each side of the body cavity. The apices of the ovarioles are joined by filaments to the posterior connective tissue of the short salivary glands. Each ovariole is a long tube in which the oocytes lie in a single chain, with the most mature nearest the posterior end. The four pairs of ovarioles of one side open into an oviduct meeting with that of the other side to form a common median oviduct which becomes the vagina and leads to the exterior. Leading from the vagina is a tube which expands into a saclike *receptaculum seminis* that is usually brownish-coloured. A dark coloured body of unknown function is situated in the middle of the common oviduct in many species. In Tubulifera the organs are similar except that the ovarioles are connected by filaments to the long salivary glands.

In male Terebrantia the testes are ochre, orange or dark brown coloured and can be seen through the body wall lying in abdominal segments 6-8 (Fig. 2). From each testis a narrow, coloured or colourless tube, the *vas deferens* leads backwards and expands a little into a *vesicula seminalis* before meeting with its fellow in a common duct, the *ductus ejaculatorius*. The upper end of the duct is somewhat expanded and the expansion may serve as a *spermatheca*. The lower end opens in the phallus. Opening into the upper end of the duct are a pair of large, colourless *accessory glands*. In the Tubulifera the organs are similar, except for the presence of two pairs of accessory glands. The reproductive organs are described by Priesner (1926), Klocke (1926), and Sharga (1933).

Musculature. Muscles are numerous and well developed, as may be expected from the activity of many thrips. Priesner (1926) gives the most complete account of them.

Circulatory Apparatus. A dorsal tube in the abdomen serves as heart and aorta for the colourless blood.

Respiratory System. Four pairs of spiracles are present (Fig. 1), the first on the mesothorax, the second on the metathorax, where it may be very difficult to see in many Thripids, the others on abdominal segments I and VIII. Those on the thorax, particularly in the Tubulifera, are surrounded by a peritreme, which possibly has a sensory or glandular function. The spiracles are connected with one another by a tracheal system ramifying throughout the body and sending branches to the legs, and one to each antennal segment II.

Fat Bodies, Oenocytes, Chromatophores. Fat body cells are found on either side of the body cavity and amongst the internal organs (Priesner 1926, Sharga 1933). Oenocytes lie in the outer parts of the fat body; they are gathered together in complexes placed close to the intersegmental connective membrane in Tubulifera (Klocke 1926) and in mounted insects their position is often clearly marked by dark vacuoles. Crimson, red or yellow chromatophores (Schmidt 1919, Klocke 1926) lie below the hypodermis in many species (see coloration above). Micropores, which are regularly placed on the abdomen and meso- metathorax, may have a glandular function. Their development and internal connections seem not to have been studied. They are not true pores as they are covered with a thin film of cuticle.

Physiology.

Whilst we have some knowledge of the anatomy of Thysanoptera, we know practically nothing about the detailed function of their organs. The study of the function of an organ is complicated, but we get some help from observing the reactions of a living insect to a stimulus that affects one organ more than the others. A huge field for research exists in observation of the responses of thrips to sensory stimuli such as light, temperature, humidity, vibration, chemicals and tactile stimuli, and by applying the knowledge gained from these observations to the more detailed study of the function of individual sensory organs.

The response to light is varied: adults and larvae are chiefly diurnal in activity; certain Phaeothripids are partly crepuscular and spend much time under bark or fungus; various Terebrantia and Tubulifera live in the subdued light of galls; the prepupal and pupal stages avoid bright light, but this is linked with temperature and humidity responses.

Almost nothing is known about digestion and absorption, but as a very large number of species swallow the juices and chloroplasts of the superficial cells of flowering plants, some feed on fungus and fungal spores and the others on the juices of small Arthropoda, there are chemical differences in the three chief types of food and there is likely to be a corresponding variation in the digestive fluids.

Amongst other physiological problems awaiting investigation are excretion, muscular activity, blood circulation, respiration and reproduction.

Parthenogenesis, or reproduction without the act of fertilisation, is common amongst certain species of Terebrantia. It seems constant in *Aeolothrips vittatus* Hal., *Pseudoarticulella obscurus* (Müller), *Heliothrips haemorrhoidalis* (Bouche), and *Thrips nigropilosus* Uzel in Britain, where females are numerous and males have not been found. It is almost constant in *Aptinothrips rufus* (Gmelin) 120 ♀♀ : 1 ♂ in N.E. Scotland. Temperature seems the most important factor, for in *Parthenothrips dracaenae* (Heeger) only females occur for generations in hot glasshouses, and males are developed after the temperature has fallen, and in *Aptinothrips rufus* the proportion of males to females seems better balanced in Finland than in the south of England.

Immature Instars and Metamorphosis.

Eggs. The eggs of Terebrantia have thin, colourless shells and whitish or yellowish contents, and each is laid in a slit made in the superficial cells of plant tissue by the ovipositor of the female. The long axis of the egg lies more or less oblique to the outer surface of the plant tissue, with the head end projecting slightly, and the developing larva faces the exterior to which it climbs on hatching. The eggs are generally scattered amongst the soft tissues of the plant. In the Melanthripidae and Aeolothripidae the eggs (Fig. 6) are cylindrical, slightly curved along the axis, longer than wide, with the bottom rounded and the top rather flattened and oblique to the axis. In the Thripidae the eggs are cylindrical, usually slightly curved, and with both ends rounded. Tubulifera lay hard-shelled eggs, often coloured and sculptured, straight cylinders, rounded at the bottom and tending to be more constricted at the top, which is knobbed in some species. The eggs are laid attached to flowers, leaves, under fungus or in galls, and they often rest with the long axis horizontal to the support. Owing to the gregarious habits of many species, the eggs may occur in hundreds close together on wood or bark under fungus or in galls. In Phlaeothripids they measure 350-550 : 130-250 μ and in Terebrantia a little less. Depending on the species of thrips, the temperature and other factors, the egg stage lasts 2-20 days. The larva emerges from the anterior end of the egg, leaving about $\frac{2}{3}$ of the shell embedded in or fixed to the plant. The emergence hole is more or less circular but with an irregular margin.

Larva I. Depending on the species, the newly-hatched larva varies from $\frac{1}{4}$-1 mm. in length. It is almost transparent, but shows the coloration and other characters of its species. As in the adult the body is divided into head, three thoracic and eleven abdominal segments, but the cuticle is usually colourless, delicate and not strongly sclerotized except in a few places. The ocelli are absent, the eyes reduced to 3-4 facets, the antennae shorter, with usually a smaller number of segments, mouthparts less strongly sclerotized; with the absence of wings the thorax is simpler in structure; the legs are much alike one another and each ends in a single segmented tarsus that often bears two claws; there are three pairs of spiracles—mesothoracic, second and eighth abdominal segments; the chaetotaxy is different (Fig. 7). The nervous system in most species is concentrated in the thorax, only slender nerves entering the head. Larvae of this instar feed on plant juices, even in those species which are predacious in the next instar and as adults, but more observations are needed on the feeding habits of instar I of predacious species. The stage lasts only a few days. When full grown the insect is about twice as long as when first hatched. It now seeks a sheltered place on or near the host plant where it moults its cuticle.

Larva II (Fig. 7) emerges from the cuticle of Larva I pale and soft, but it soon develops pigment and becomes tougher. It differs from I in greater size, coloration, cuticular structure, chaetotaxy and shape of antennal seqgments. This stage feeds actively till it reaches its full size, which is about that of the adult thrips. It varies in duration, depending on the species, environment and season—lasting 2-3 days in *Thrips tabaci* in summer, some months in overwintering *Kakothrips robustus*, 6-8 months in many overwintering Phlaeothripids. In most species the sex cannot be determined from the external appearance of II (*Taeniothrips ericae* Hal. hibernating larvae excepted), except by the generally smaller size of males. At the end of this stage the larvae seeks a place for moulting. The moult occurs amongst the soil or litter under the plants frequented by the larvae of Melanthripidae in which the pupal instars are unknown, in similar positions but inside a tough cocoon spun by the larvae in Aeolothripidae, on the food plants in some Thripids or amongst soil and debris in other Thripids, or under moss, bark, fungus, debris below food plants, or on flowers or leaves of hosts in Phlaeothripidae.

Depending on the species, the larvae I, II are slow, medium or rapid in movement. I have never seen larvae jump, even in species in which the adults jump. As Priesner (1926) remarked, there is an undoubted morphological resemblance between adults and larvae, in so far as both have a similar mode of life, i.e. adults with long hairs have long-haired larvae.

Prepupa. The prepupa emerges from the larval II cuticle. It is followed in the Terebrantia by one and in the Tubulifera by two pupal instars. Neither the prepupal nor pupal instars feed, but they can walk slowly and they avoid light. The two or three instars are usually passed in the same place.

The general characters of the prepupa are: antennae short, segmentation of antennal segments obscure, body coloration paler than in larva, eyes small without facets, cuticle smooth, chaetotaxy of longer but fewer hairs than that of larva.

Aeolothrips: entire pupation passed in strong, brown silk cocoon, prepupal antennae turned back over head, duration of prepupal and pupal instars about equal.

Thripidae: antennae held straight in front of head (Fig. 8), wing-sheaths short, ovipositor-sheaths on ventral surface of abdominal segments VIII and IX mark females and are probably characteristic of all Terebrantia; prepupal instar of shorter duration than pupal.

Tubulifera: antennae curved sideways, wing-sheaths absent, prepupal duration shorter than pupal.

Pupa. Terebrantia: antennae longer than in prepupa, turned back over prothorax; chaetotaxy of long hairs; wing-sheaths long in macropterous specimens, pigmentation sparse; cuticle colourless, smooth; sheaths of ovipositor large; apex of abdomen more or less pointed in female (Fig. 8), rounded in male.

Tubulifera: Pupa I and II antennal sheaths lie against side of head, pointing downwards and somewhat movable at tips, the abdomen ends in a long narrow sheath (anal spit) enclosing the terminal hairs. Pupa I differs from II in the shorter antennal sheath, the shorter wing-sheaths in macropterous specimens, and the shorter anal spit. Colour of both like that of larva.

Before an insect moults it has assumed the morphology of the succeeding instar; therefore larva II may be seen inside the cuticle of I just before the latter moults, and similarly for the other instars to the adult. It is essential not to confuse the structure and coloration of the enclosed insect with the external cuticle about to be moulted. Each of the immature instars usually becomes darker coloured as it reaches the end of its stadium. This phenomenon is also seen in the adult in which the newly emerged insect is pale yellow with shades of grey in *Taeniothrips vulgatissimus* and *Thrips physapus* and requires some time to become dark brown or almost black in hibernating females (see coloration above).

Bionomics and Host Plants.

Predacious species tend to move more rapidly on their feet than vegetarians. Amongst vegetarians some species, *Chirothrips*, many Phlaeothripids, walk slower in general than others, *Taeniothrips vulgatissimus*, *Thrips fuscipennis*. When walking, both sexes cross but short distances before stopping. The antennae are kept flickering in front of the head, apparently to sensitize the immediate environment and to influence the direction of movement. Many species can walk backwards for a few steps as easily as forwards. *Aptinothrips*, which never develops wings, must depend on its legs and chance transport by wind and water for dispersal. Its species are the most widely dispersed of British Thysanoptera They feed on grass.

Certain species are capable of jumping about 1 cm. high, and this capability may be associated with wings fully developed, reduced or absent. The jump is often preliminary to flight—the thrips starting to spread its wings before jumping and then apparently opening them fully in the course of or at the end of the leap. Some species take flight very readily, others are loath to do so and many will not fly. The macropterous wings of some species are possibly too small for flight. When macropterousness and various degrees of wing reduction occurs in a species, the dispersal of the species is accomplished by the winged adults flying during the warmest period of the year, *Sericothrips staphylinus*, *Platythrips tunicatus*, *Hoplothrips ulmi*. For these species there may be very wide gaps between the larval host plants. Thrips are not strong fliers, though the females of certain species, *Limothrips cerealium*, may traverse quite considerable distances with the help of the wind when seeking winter quarters or larval food plants. According to Hardy & Milne (1938) and Freeman (1945), there is quite a large population of thrips at different levels in the air over England during warmer seasons of the year. *Frankliniella intonsa* was found at 2,100 ft., and other species have been found at higher levels abroad. It seems that the stimuli for flight are fairly high to high temperature, lack of strong wind, probably a certain fairly high intensity of light and low degree of humidity, which act on an insect at a particular state of sexual development.

The life-history of the species is linked with that of its host(s), flowering plant, fungus or the insects which frequent certain plants. Adults and larvae feed on plant juices, which they obtain by suction after the mouth-parts have penetrated the external 2-3 layers of cells. They tend to feed on the undersurface of leaves or on the sides of stems, so that they feed in an inverted or more or less vertical position. The attacked surfaces of leaves, green stems and petals are marked by a silvery sheen, due largely to air occupying the cell cavities from which the thrips have removed the normal contents of protoplasm and fluid. Certain species, *Heliothrips*, *Parthenothrips*, mark the attacked surface with spots of faeces which often become dark coloured through the development of fungus in the excreted liquids. As the adults of many species are gregarious, and the larvae are born on their food-plant, from which they do not wander far, visible damage tends to be localised on the plant. The damage may be caused by adults of one or both sexes of one or more species, particularly to flowers, or by adults and larvae of a single species, for it is seldom that adults and larvae of two or more species attack a plant at the same time and place. Adults are found on more species of plants than larvae. If larvae pass from food-plants to soil for pupation, they may occur on plants which are not hosts but happen to lie in the way. Each fungus-feeding species seems to confine itself to few closely related species of fungus, which are eaten when they are soft through the absorption of water. Adults swallow fungal spores, but I am not certain if the larvae do so. The predacious species suck the juices of small Arthropoda, including Thysanoptera, which they kill. Under certain conditions vegetarian species will attack man and suck blood plasma, cf. Bailey (1936).

Some species breed on one species of plant only, others on members of a single genus or of closely related genera and others on many species belonging to different families. Besides those plants on which a species may breed, adults of certain species feed also on other species of plants and they may be found on many different species of plants and objects. A species of plant that serves for rearing larvae of a species of thrips, I call a *host plant* of that species. A plant or object on which an insect is found may be called the *finding place.* Sometimes the finding place is also the host plant, but too often authors have named the plant on which an insect happens to have been found the host plant of the insect, without any proof that the insect breeds or feeds on the plant.

Some species are of considerable economic importance through their habits of breeding and feeding on cultivated plants. The injury may be direct, or indirect through the transmission of a virus disease or micro-organism associated with disease. Whilst the numbers of species of economic importance is not large, it is proportionately about as high as in many other orders. Some species probably help in the fertilisation of flowers.

Females are generally larger than males. They are usually found in larger numbers, because in many species they hibernate whilst the males succumb during early winter, and because males may be scarce or absent owing to parthenogenesis. In many species the sexes seem to occur in about equal numbers. Courtship is brief and seems unspecialised—merely the avid male follows a female for a short time and distance or he grabs her prothorax with his first pair of legs, then jerks himself up so that he rests on her back and is carried about by her, then he swings his abdomen about in attempts to copulate. She often throws him off, but she may carry him for a few minutes. Copulation lasts only a few seconds in most Thripids and Phlaeothripids, but longer in Aeolothripids. The sexes are promiscuous within the species. Owing to the different positions of the male genitalia in the two suborders, the end of the abdomen in the male lies in a somewhat different position to that of the female in each group.

Depending on the species and season, oviposition may start within a few days (summer generation) or after some months (overwintering generation) after fertilisation. The average number of progeny of a female seems to be 30-50. Longevity from new laid egg to death of adult female is 1-12 months, or longer depending on species and season. Winter is passed by the adult female, female and male or any combination of adults, eggs, larvae and pupae depending on the species. Number of generations in year varies from 1 *Thrips dilatatus*, many Phlaeothripids, to 2 *Thrips tabaci* out-of-doors in N.E. Scotland, to 12 in hothouse. There is often overlapping between the generations owing to the comparatively long life of the female and the short time taken for the development of the summer generations. Like other organisms, each species is likely to exhibit a cyclic increase and decrease in numbers during a long period of years.

Gregariousness is common, its causes being the needs for fecundation, food, oviposition, shelter or a temporary resting place between host plant and soil. It does not lead to social or subsocial behaviour, as there seems no mutual co-operation between two generations, even in those species which inhabit a particular site continuously for some years. The numbers range into the hundreds per square foot of surface. The life history of the species determines the time when the largest numbers will gather together. This is the end of summer or early autumn for many Terebrantia, and early summer for Phlaeothripids that feed on flowering plants. The need for fecundation usually seems the reason for the assembly of both sexes of the " flower thrips," *Thrips fuscipennis*, *T. major*, *T. flavus*, *Taeniothrips atratus*, *T. vulgatissimus*, on flowers that are often not those of larval host plants. When females occur alone in large numbers they are usually ovigerous and on a larval host plant, or recently emerged from hibernation. Males occurring alone in large numbers in early summer are newly emerged from pupae and in late autumn they are older insects which will soon die, the females having already dispersed to winter sites. The assembly of insects may include both sexes of more than one species and, later in the year, the larvae of these or other species. The need for food and the habits of the species accounts for the large numbers of adults and immature instars of *Baliothrips dispar* on certain species of grass, and of various other Thripids on their respective food plants. The numbers are made up by adults and immature instars chiefly of one generation, but in certain Phlaeothripids, like *Haplothrips kraussei* on species of Compositae, the numbers are made up of two generations, parents and their larvae.

Many factors for gregariousness are involved in *Hoplothrips pedicularius*, in which the association between adults and young is carried to a further stage than in the Terebrantia: the insects live long, adults, eggs and all immature instars spend most time under fungus or bark close to the host Basidiomycete, *Stereum* sp., in a common dwelling place that is used continuously for a period of years, till it becomes unsuitable through decay or through the failing succulence of the host. A colony may number some hundreds of individuals in a dwelling a few inches square from which the adults and larvae emerge to feed on the fruiting surface of the fungus when this is moist with water. The thrips return to the dwelling chiefly in response to climatic factors. The need for shelter seems the chief cause for larve II of *Liothrips hradecensis* Uzel hibernating together in large numbers under moss, etc. *Odontothrips* spp., *Oxythrips* spp., may be found in large numbers on herbage in spring and autumn during the course of their journey between host plant and soil.

Associates and Enemies.

Association with other Animals. There seems no close association between any British species and another species of animal, except that predacious species usually occur where they can obtain certain species of small Arthropoda, and *Limothrips cerealium* females may hibernate amongst the Coccid, *Cryptoccus fagi* Barensp., on beech bark.

Enemies may be divided into two groups—one harming indirectly by destroying, or feeding on the vegetation that could otherwise have served to rear thrips, and the other directly by killing the insects. Man should be placed amongst the indirect enemies from his habit of building houses, roads, railways, water reservoirs, etc., but whilst he eliminates the flora and consequently the thrips fauna over large stretches of country, he practises arable and grassland farming, the growing of woods and hedges, the cultivation of fruit trees, shrubs, flowers and vegetables, and by the introduction of foreign plants he enriches the flora to the benefit of many species of thrips. The sides of roads and railways and the banks of canals with their varied flora offer some of the best hunting grounds for the collector of thrips. Man even introduces foreign thrips to his glasshouses, so it seems that whilst he has exterminated certain species of plants from the London Area, and he has almost certainly reduced the numbers of certain species of thrips, he has probably increased the total number of species compared to what were present 2,000 years ago.

All animals that feed on living plants are indirect enemies, and some like rabbits, sheep and cattle may be very potent over large areas. Aphids, Coccids, Tetranychid mites, certain fungi, soil the green parts of plants and make them unsuitable for thrips. Direct enemies include predacious Thysanoptera, Hemiptera, parasitic Hymenoptera, spiders, mites, nematodes, fungi. The smaller insectivorous birds probably feed on some of the larger thrips, but I have not found them doing so. Ducks, geese and poultry are indirect enemies.

Rearing.

Thrips are difficult to confine for breeding purposes because of their small size, activity even under comparatively low temperature, and ability to squeeze through a very narrow opening. Other difficulties are the condensation of water inside a cage, the need to change the food at frequent intervals, the development of fungi on cut foliage in a moist atmosphere, or the desiccation of the plant in a dry atmosphere. The conditions are easier for rearing Phlaeothripids than Thripids. Test-tubes plugged with cotton wool, vessels of glass or cellophane, glass-topped receptacles, should be kept in a fairly constant temperature and not exposed to sunlight. Methods of rearing each species have to be discovered by the experimenter. The following papers deal with life histories and methods of rearing: Bailey (1933), Buhl (1934), Hodson (1935), Rivnay (1935), Sharga (1933 a, 1933 b), Wardle, MacGill and Simpson (1927), Williams (1915), Callan (1947).

Literature.

The literature on Thysanoptera is scattered in many journals and written in many languages. Since the British species are probably all represented in the European continental fauna and many occur in N.

America and in other parts of the world, a comprehensive study of the order has to include all writings on Thysanoptera, and for this purpose the monthly review of world literature in the *Rev. Appl. Entomology*, the annual references in the *Zool. Record* and the quarterly abstracts of *Biol. Abstracts* are invaluable. Haliday (1836-7) laid the foundations of classification of the order; Uzel (1895) monographed the world species in Bohemian and German; Hinds's (1905) monograph of the U.S.A. species is out-of-date but still useful; Bagnall (1908-36) has added the greatest number of species to the British list, and his collection of thrips is now in the British Museum (Natural History); Williams (1913-17) has added a few species to the British list and (1915) written on the Pea Thrips; Karny (1922) published a key in German to the genera of the world and this was translated into English and slightly altered to suit U.S.A. conditions by Watson (1923); Hood (1908 onwards) has published a number of invaluable papers, chiefly on systematics; Morison (1928 onwards) has published a few papers on the bionomics and systematics of British species; Speyer (1934 onwards) has published on the systematics of some British adults and larvae; Priesner (1926, 27, 28) monographed in German the European species, dealing with adults and immature instars, and this is the most complete account of British species, but it needs to be brought up-to-date; Kloet and Hincks (1945), adopting a modification of Priesner's classification, listed the British species. References to other papers will be given in the text.

The classification adopted in this paper is a slight modification of Priesner (1926, 27, 28) and most of the names of the genera and species will be found in Kloet and Hincks (1945), in which the names of about a dozen species need emendation or explanation.

Museum Collections.

A collection of named species on microscope slides has been deposited with the London Natural History Society and will be available to the student for comparison. The British Museum (Natural History) has a very large collection of British and foreign species, including Bagnall's collection. The writer will be pleased to help with the naming of specimens.

Classification.

The group of insects was raised to ordinal rank by Halliday in 1836 and named by him Thysanoptera (*thusanos* fringe, *pteron* wing) from the arrangement of long hairs along the margins of the wings. The names Physopoda or Physapoda or Vesitarses have also been applied to the group from the protrusible bladder-like structure at the end of each tarsus. Italian and German writers frequently use the tarsal character for the common name of the insects, Fisapodi or Blasenfüsse (bladder-feet). Writers in English generally use the word "Thrips" for any specimen of the order. When used in a popular manner it may be written with a small t, but it should end with an s in the singular or plural.

Thrips is Latin name derived from the Greek *thrips*, a wood-worm, and is in the singular number and masculine gender. When *Thrips* is used without or with a prefix for a genus, the name of any species in the genus, if it is an adjective, should be in the masculine singular, but this was not recognised by many of the early writers, hence *Thrips physapus* L. 1761, 1767, Haliday 1836, and *T. minutissima* L. 1761, 1767, Haliday 1836, whilst Uzel (1895) considered *Thrips* feminine and declined the specific names accordingly. *Thrips* is the name given by Linnaeus in 1758 to the genus, and when used for the genus it should be written with a capital letter and underlined or printed differently from the general text.

Common names for the species are gradually creeping into the language, e.g. Onion Thrips, *Thrips tabaci* Lind.; Rose Thrips, *Thrips fuscipennis* Hal.; Pea Thrips, *Kakothrips robustus* (Uzel); Pear Thrips, *Taeniothrips inconsequens* (Uzel); Lily Thrips, *Liothrips vaneeckei* Priesner. Many common names are found in American economic literature.

Classified according to their structure, Thysanoptera are placed in the Insecta subclass Pterygota, since they are winged though sometimes secondarily wingless, with no abdominal appendages except genitalia. They are placed in the division Exopterygota of the Pterygota since the wings develop externally. Classified according to their type of metamorphosis, they are in the division Heterometabola, since the metamorphosis is simple, and in the subdivision Paurometabola as the young resemble the adults in general form and mode of life; postembryonic development being one of gradual growth, with the acquisition of wings. They have an incipient pupal stage. The immature feeding stages of Paurometabola are generally called "nymphs" in English entomological textbooks, in which the word "larva" is applied to the immature feeding stages of the Holometabola or insects with a complex metamorphosis and with wings developing internally, but I use the term "larva" for the immature feeding stages of Thysanoptera. Continental European writers often use the term "nymph" for the Thysanopterous prepupa and pupa.

In mode of life and metamorphosis the Thysanoptera show most resemblance to the Coccidae in Hemiptera-Homoptera. For a discussion of their affinities with other insects the reader is referred to Priesner (1926).

Only one species of fossil thysanopteron, *Aeolothrips brodiei* Cockerell, has been described from Britain, from the Oligocene of the Isle of Wight. The order is represented by many fossil species in other countries, the Baltic amber (Oligocene) being particularly rich. All fossil species are clearly recognisable as Thysanoptera and show no transition to other orders. The majority of the species belong to generalized groups and some have been assigned to existing genera.

People often confuse the Thysanoptera with Thysanura (bristle-tails, silver fish, etc.) which are much more primitive insects, wingless, with the mouth-parts adapted for biting, many segmented antennae and with appendages at the end of the abdomen. They also confuse Thysanoptera with Collembola (spring-tails) an order of primitive insects, wingless, with mouth-parts chiefly adapted for biting, antennae usually four-segmented, abdomen six-segmented and bearing usually three pairs of appendages.

Thysanoptera.

Thysanoptera are small insects 0.4-10 mm. long (13 mm. stretched) (0.4-6 mm. long in British species), and usually 2-3 times longer than broad; rather dull coloured, usually various shades of brown or yellow, and seldom banded; antennae 4-9-segmented, usually short; mouth-parts (Fig. 3) asymmetrical, adapted for piercing, rasping and sucking; maxillary and labial palps present. Prothorax well developed, free, that is not rigidly united with the head and mesothorax. Legs usually of moderate length. Tarsi two- rarely one-segmented, each with a terminal, protrusible vesicle and often without terminal claws. Wings, when present, usually narrow with greatly reduced venation and long marginal setae. Abdomen with ten distinct and a vestigial eleventh segment in both sexes. Cerci absent. Metamorphosis accompanied by an incipient pupal instar.

Key to Families.

A. Female with saw-like ovipositor (Figs. 4, 5) consisting of two pairs of gonapophyses developed from the ventral surface of abdominal segments VIII and IX; in the female abdominal segment X is usually conical, rarely tubular, and is divided lengthwise along the ventral surface; in the male abdominal segment IX (Figs. 2, II C) is usually abruptly rounded, never tubular and bears dorsally the reduced segments X and XI. Wings bearing microtrichia (Fig. II B) on the surface (except Merothripidae) and hairs on the veins and long cilia (except Mymarothripidae) along posterior margins (Figs. 1, 9); the forewing with an anterior marginal vein and at least one long vein reaching or almost reaching the apex. Egg smooth, delicate-shelled (Fig. 6), inserted in the superficial tissue of plants. Larvae two instars (Fig. 7), usually pale coloured, white, yellow or reddish; one prepupal and one pupal instar (Fig. 8).

Sub-order Terebrantia Haliday.

I. Ovipositor (Fig. 4) well developed, in retracted position curved upwards (backwards); pronotum without dorsal sutures; wings broader, rounded at ends and coated with microtrichia; body not depressed; antennae nine-segmented (Fig. 10). Egg with anterior end obliquely abbreviated (Fig. 6).

Super-fam. Aeolothripoidea Hood.

a. Antennal segments freely movable; maxillary palps three-segmented, labial palps two-segmented; claw not present at base of second segment of fore tarsus; larvae apparently not predacious; pupation unknown.

Fam. Melanthripidae Bagnall.

aa. Distal antennal segments closely united (Fig. 10); maxillary palps three-segmented; labial palps four-segmented; claw-like appendage present on base of second segment of fore tarsus (Fig. II A); larvae predacious; pupation in cocoon.
Fam. Aeolothripidae Uzel.

aaa. Other families, Franklinothripidae, Orothripidae, Mymarothripidae are not British.

II. Ovipositor (Fig. 5) well developed, curved downwards (forwards) pronotum without dorsal sutures; wings narrow, pointed at ends and coated with microtrichia; body often depressed; antennae 6-8 rarely nine-segmented. Eggs kidney-shaped (Fig. 6).
Super-fam. Thripoidea Hood.

a. Antennae 6-8-segmented, rarely nine-segmented or the sixth segment with a cross-partition so that the antenna appears nine-segmented; usually bears one-, two- or three-segmented terminal style (Fig. 1); antennal segments III and IV not conical or cylindrical, each usually with a sense cone; fore tarsus without claw-like appendage at base of second segment; larvae usually phytophagous; pupa without cocoon.
Fam. Thripidae Uzel.

aa. More generalized families Hemithripidae, Heterothripidae including many fossil species are not British.

III. Ovipositor very weak, curved forwards; pronotum with dorsal sutures; wings narrow, pointed at ends, not coated with microtrichia; body more or less depressed; antennae 8-9-segmented, moniliform segments, without end style; fore and hind femora enlarged. Egg kidney-shaped.
Super-fam. Merothripoidea Priesner.
Single family, not British, Merothripidae Hood.

AA. Female without ovipositor; abdominal segment X in both sexes closed below, usually tubular (Fig. 12). Wings without microtrichia on the surface or a long series of hairs on the veins, but fringed all round with long cilia; the forewings with only one, usually simple, shortened central vein. Egg (Fig. 6) often sculptured, hard-shelled, laid on surface of plants. Larvae two instars which are often brightly coloured or banded, phytophagous or more rarely predacious; one prepupal and two pupal instars. No cocoon.
Sub-ord. Tubulifera Haliday.

I. Maxillary palps two-segmented; antennae eight-, rarely seven-segmented, with sense hairs or processes on segments III-VII; middle coxae further apart than the fore and hind coxae; abdominal segment IX not or rarely longer than VIII; terminal bristles of the abdomen seldom much longer than the tube (abdominal segment X).

Super-fam. Phlaeothripoidea Hood.

Fam. Phlaeothripidae Uzel.

The other families Pygothripidae, Hystricothripidae, Chirothripoididae are not British.

II. Maxillary and labial palps one-segmented; antennae four-seven-segmented, without sensory hairs or areas; hind coxae more widely separated than front or middle coxae. Apterous. Abdominal segment IX longer than VIII; terminal bristles of abdomen longer than the tube.

Super-fam. Urothripoidea Hood.

Single family, not British, Urothripidae Bagnall.

(To be continued.)

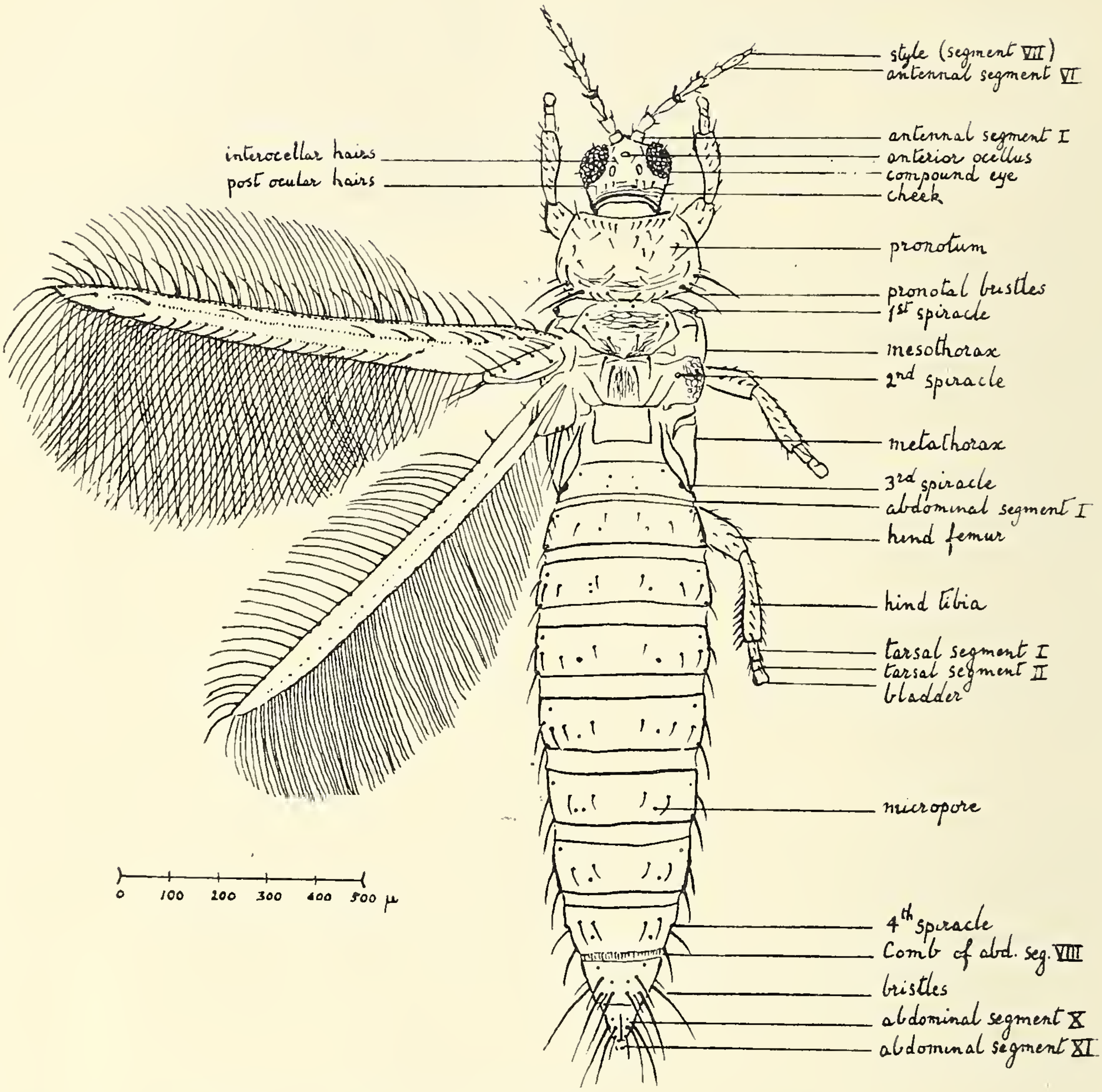

Fig. 1. *THRIPS PHYSAPUS* L. ♀. Dorsal view.

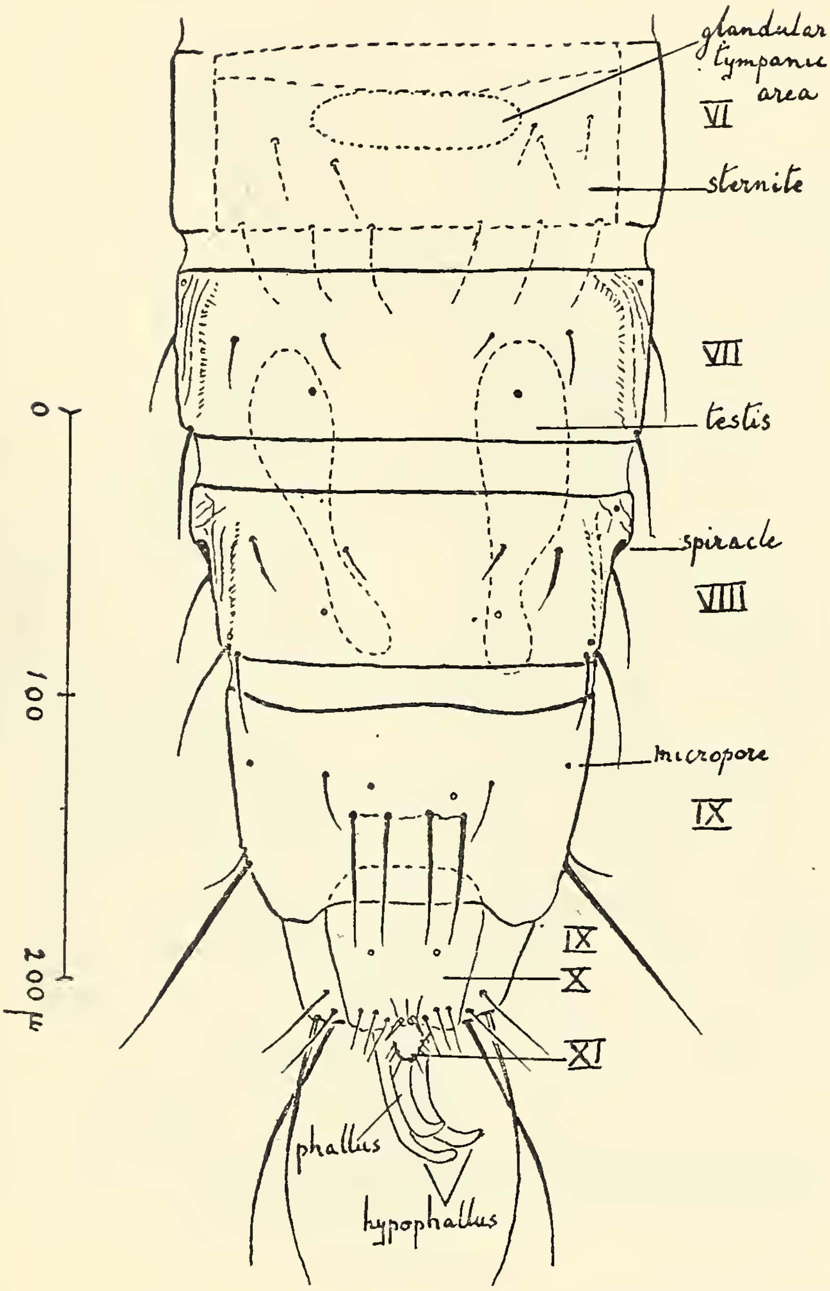

Fig. 2. *THRIPS PHYSAPUS* L. ♂. Dorsal view of end of abdomen with sternite VI seen as transparency and shown in dots.

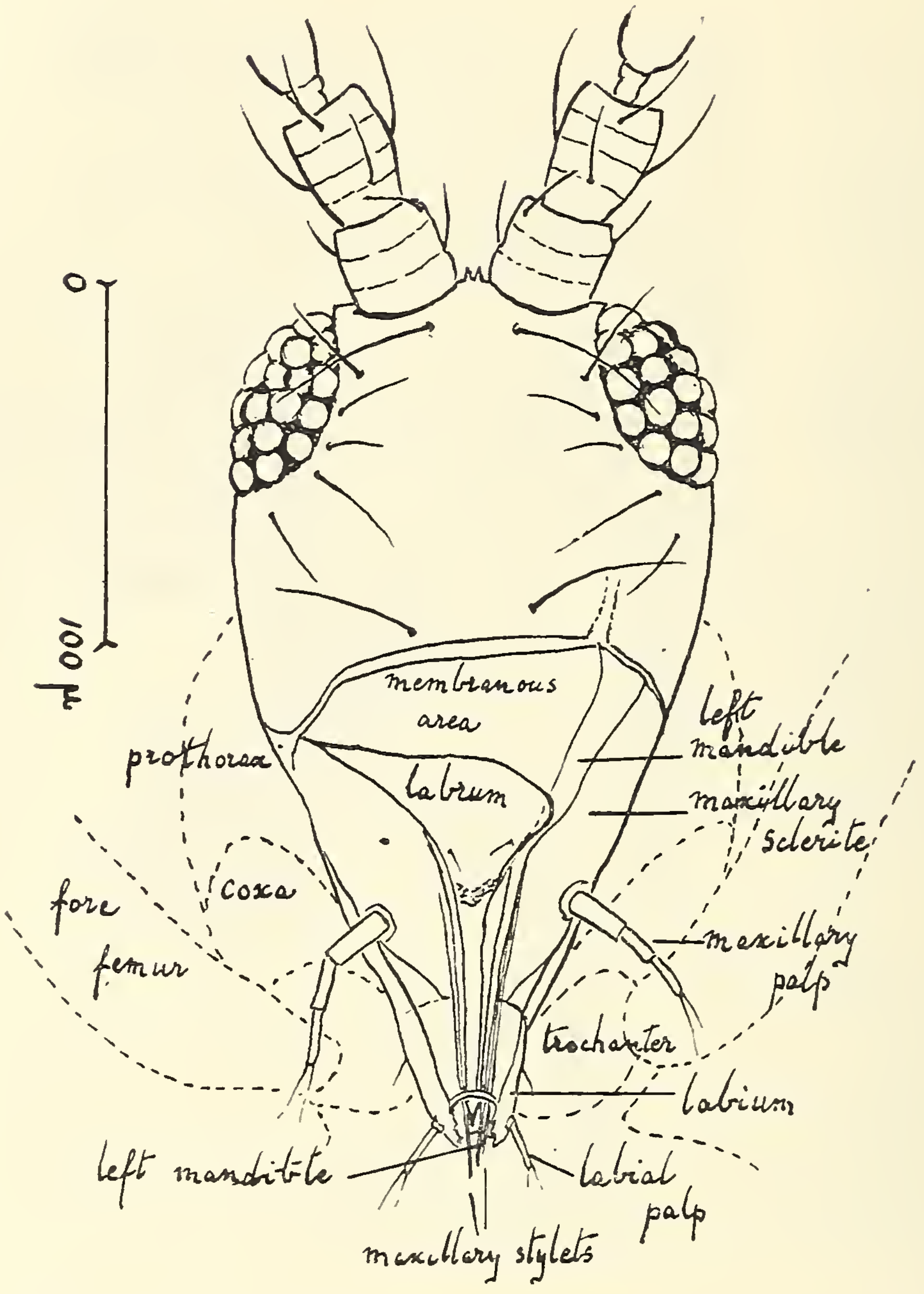

Fig. 3. *THRIPS NIGROPILOSUS* Uzel. ♀. Ventral view of head and mouth-parts.

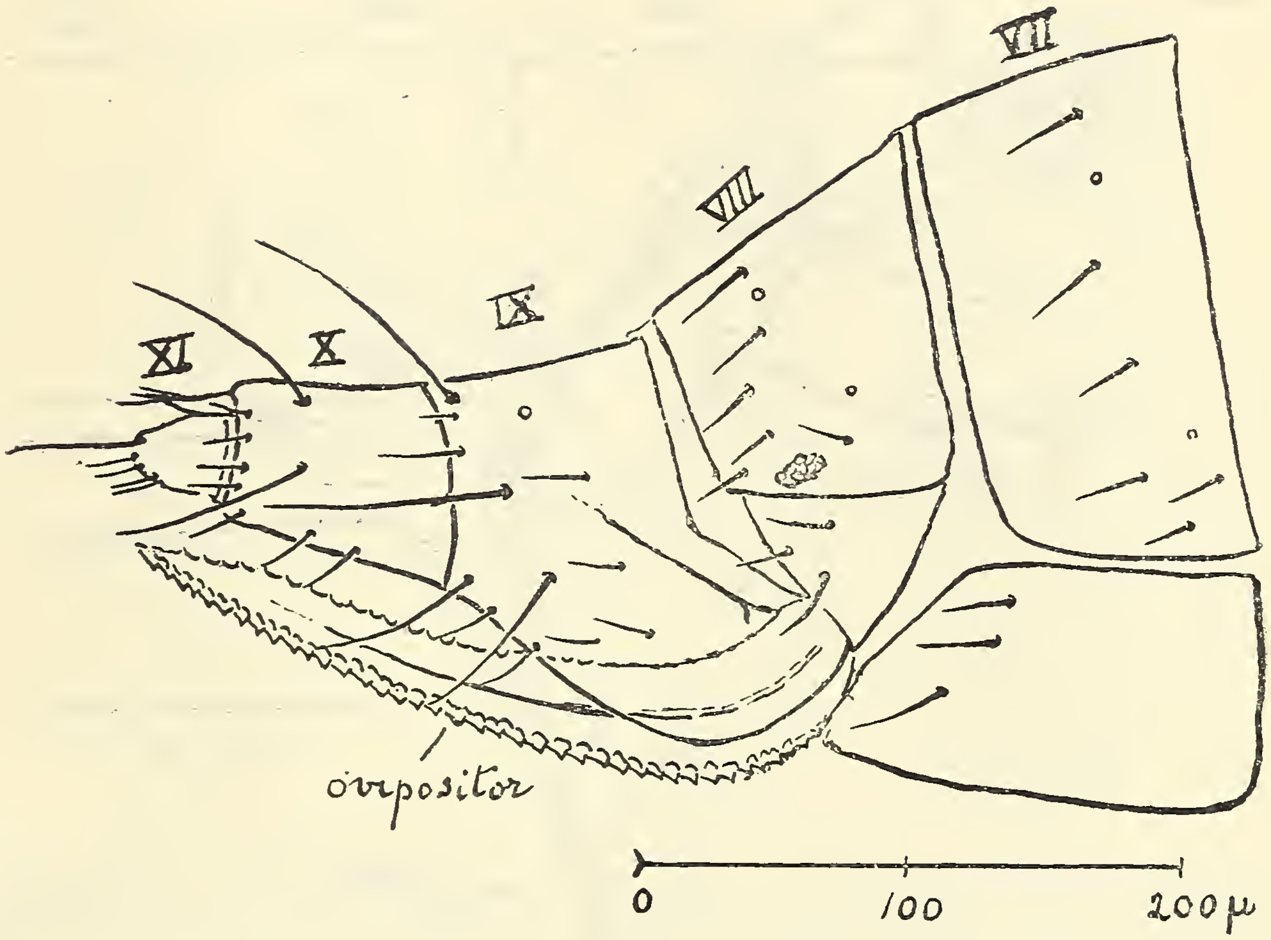

Fig. 4. *AEOLOTHRIPS FASCIATUS* (L.). ♀. Side view of abdominal segments VII-XI, with ovipositor partly extruded.

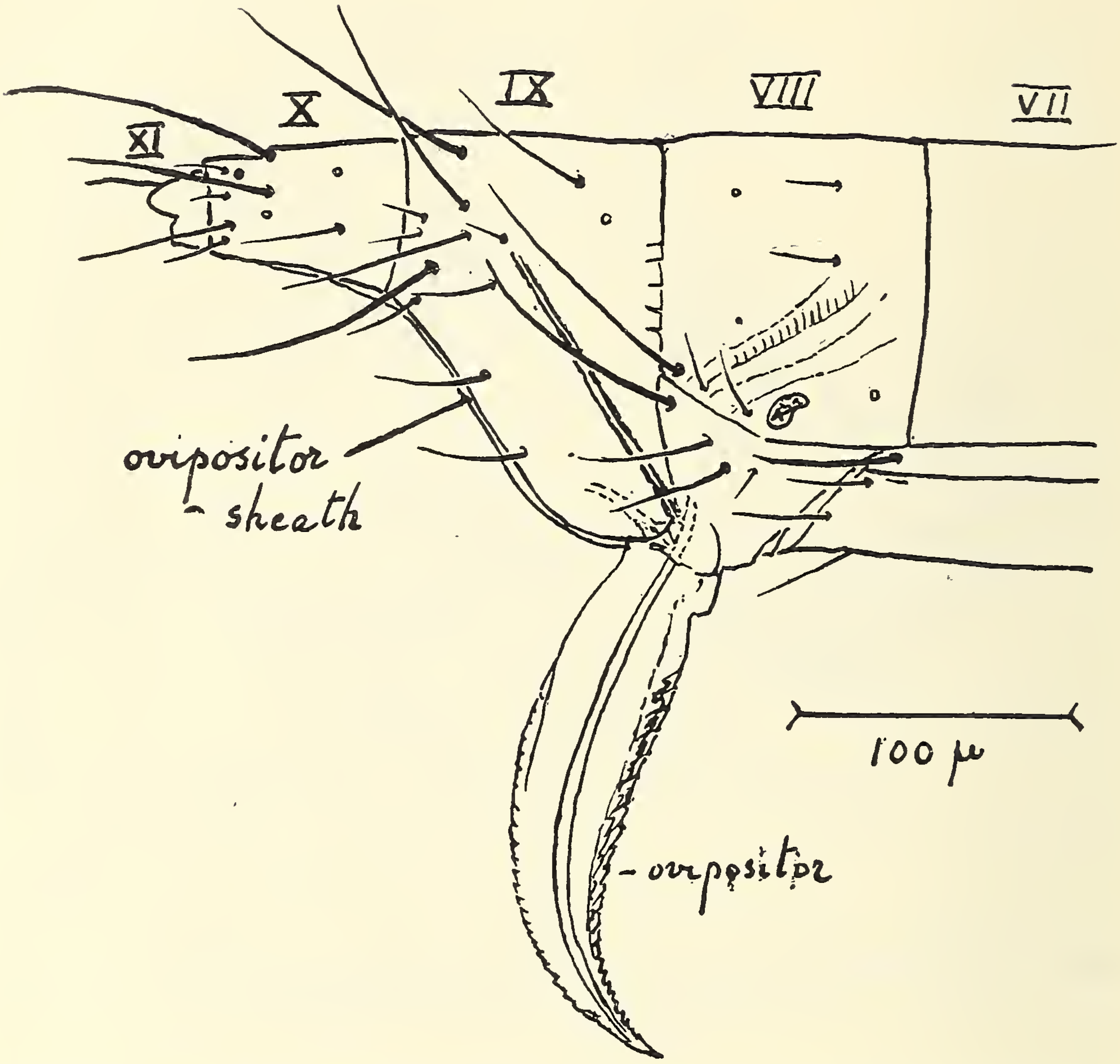

Fig. 5. THRIPS FUSCIPENNIS Hal. ♀. Side view of abdominal segments VII-XI, with ovipositor extruded.

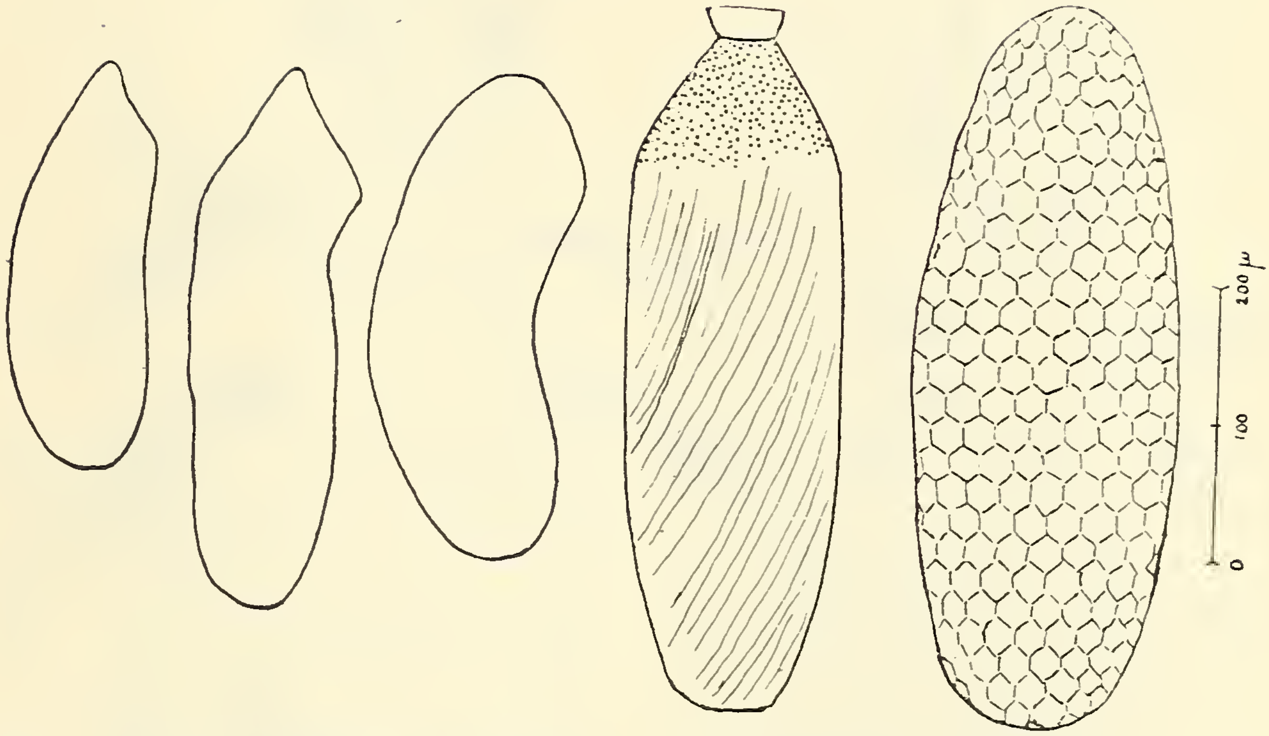

Fig. 6. EGGS OF THYSANOPTERA: *Melanthrips fuscus* (Sulzer) 310 : 100μ; *Rhipidothrips gratiosus* Uzel 420 : 100; *Thrips flavus* Schrank 375 : 156; *Haplothrips statices* (Hal.) 538 : 166, cap 26 : 50; *Hoplothrips pedicularius* (Hal.) 555 : 222μ. The hexagonal marking is not seen as distinctly as it is drawn. It is best seen in the dry shell.

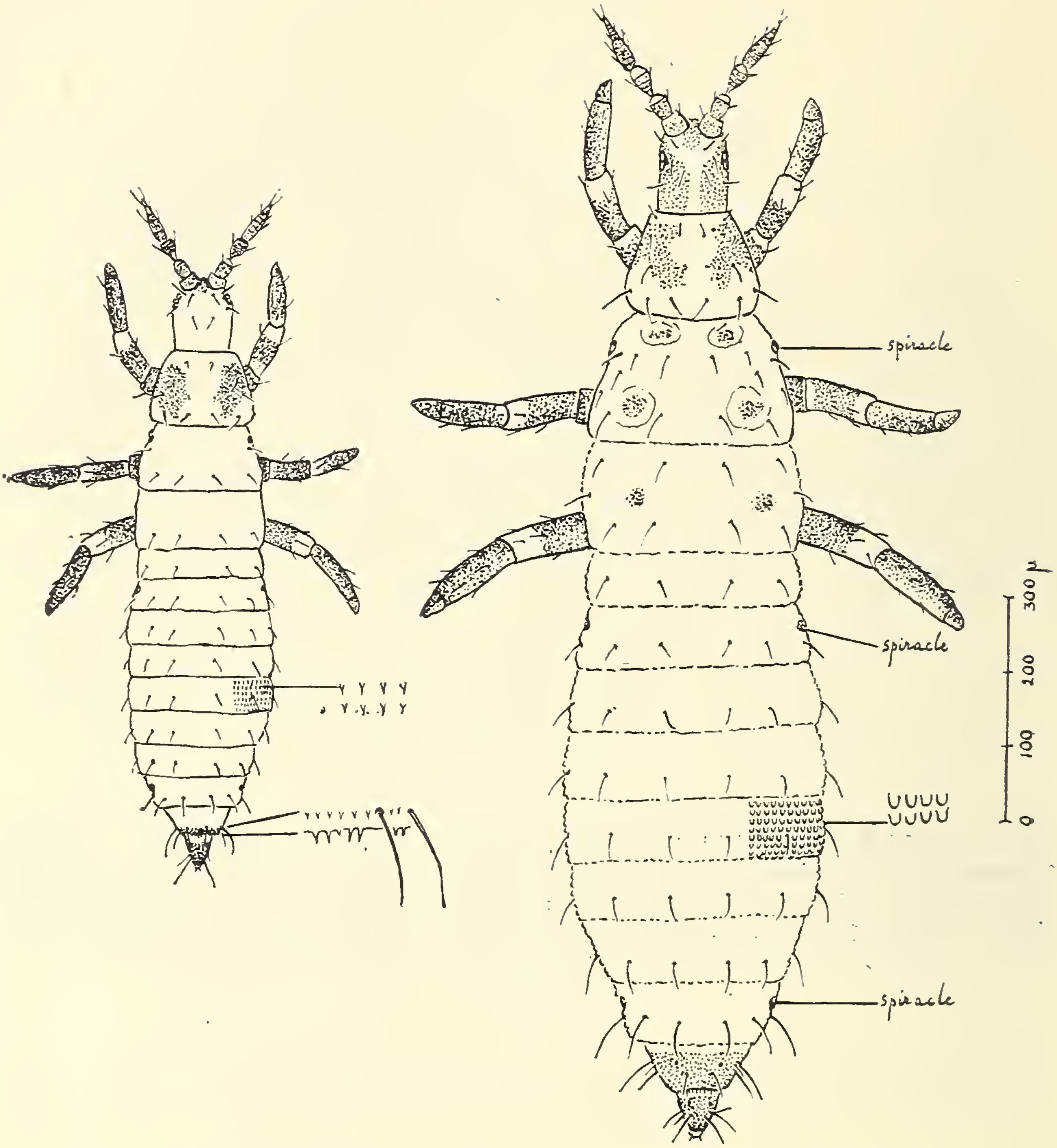

Fig. 7. *THRIPS VALIDUS* Uzel. Larvae I and II instar.

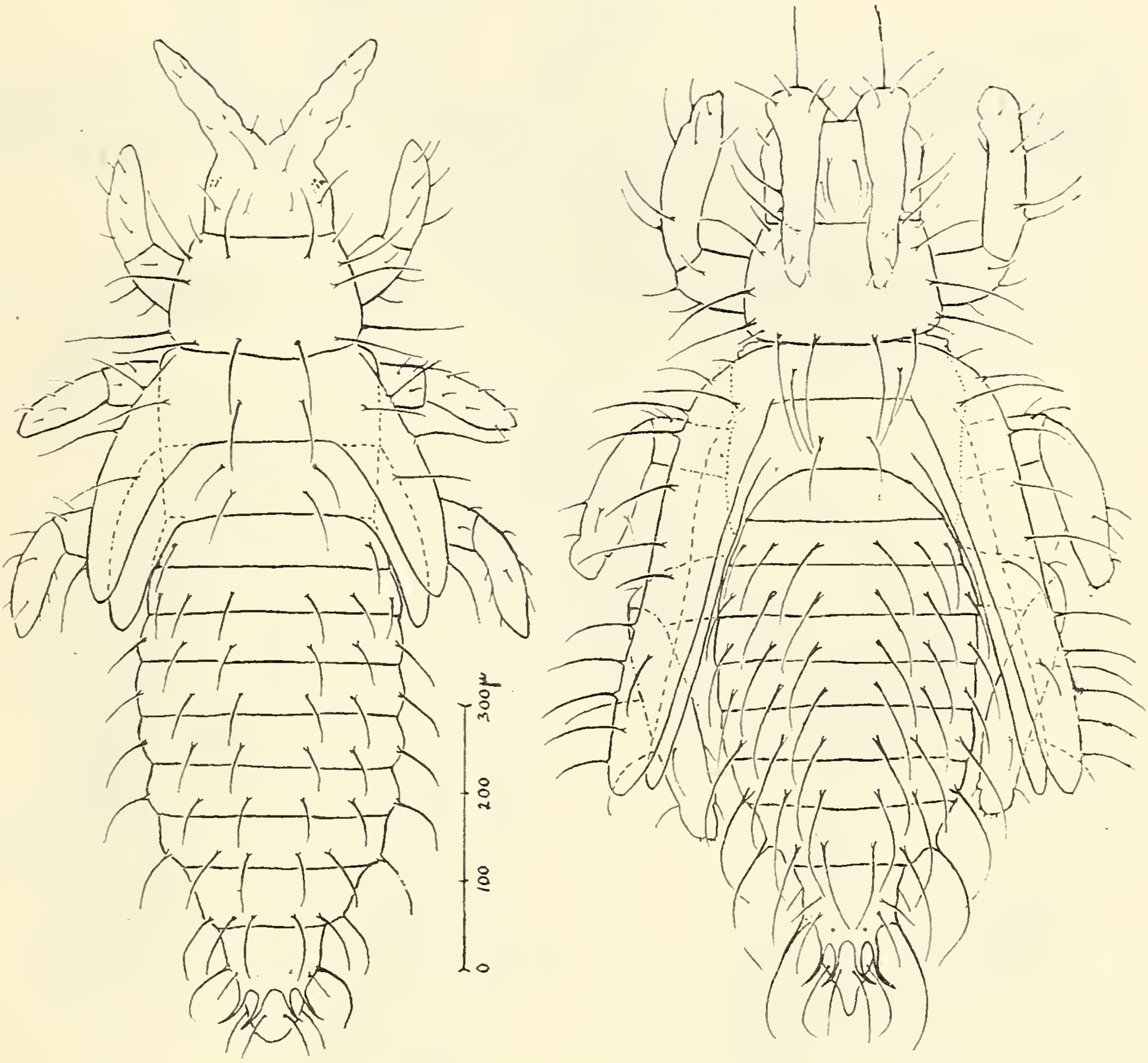

Fig. 8. *THRIPS VALIDUS* Uzel. Prepupa and pupa.

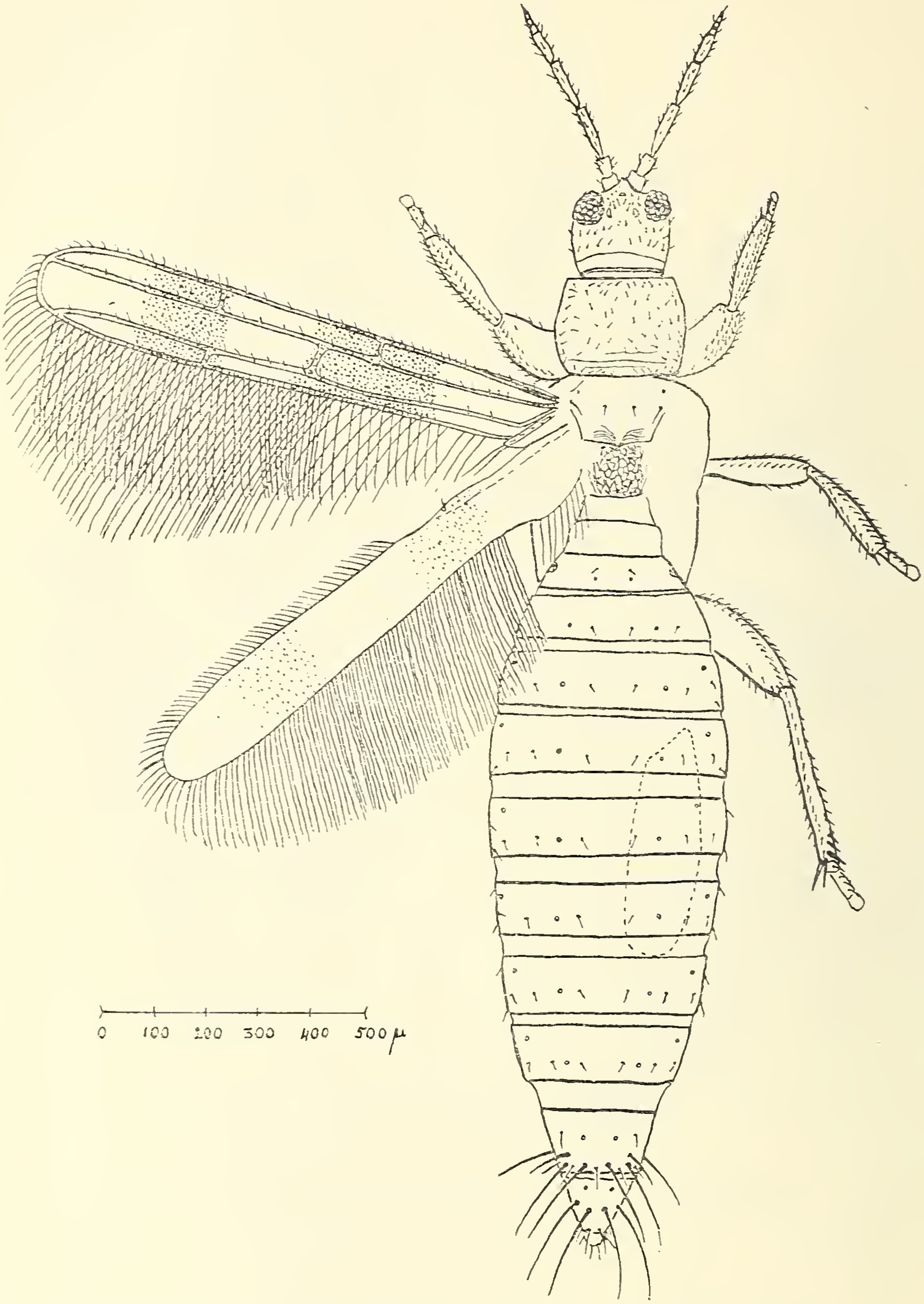

Fig. 9. *AEOLOTHRIPS FASCIATUS* (L.). ♀. Dorsal view.

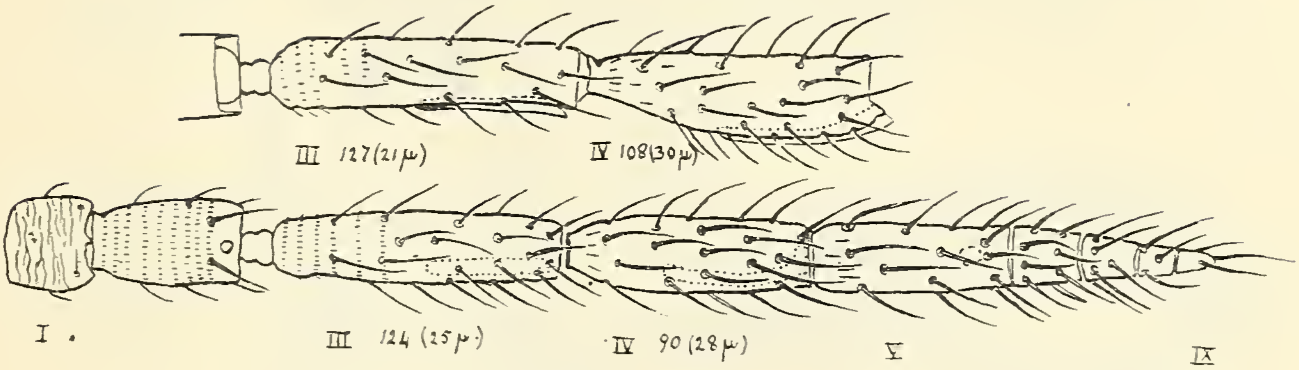

Fig. 10. *AEOLOTHRIPS FASCIATUS* (L.). ♀. Dorsal view of right antenna, with segments III-IV of another specimen in side view.

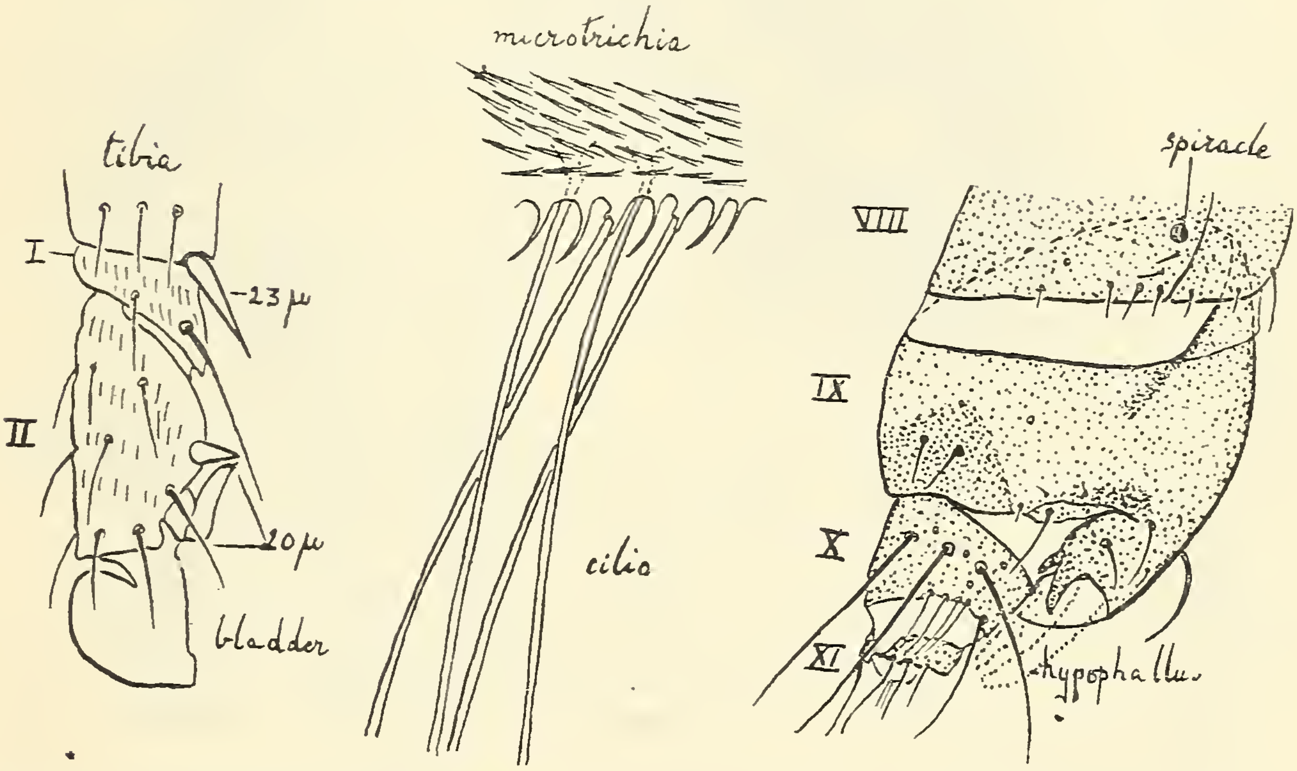

Fig. 11. *AEOLOTHRIPS FASCIATUS* (L.). A. Side view of tarsus of fore leg. B. Microtricha and cilia on portion of posterior margin of fore wing. C. End of abdomen of male in oblique view.

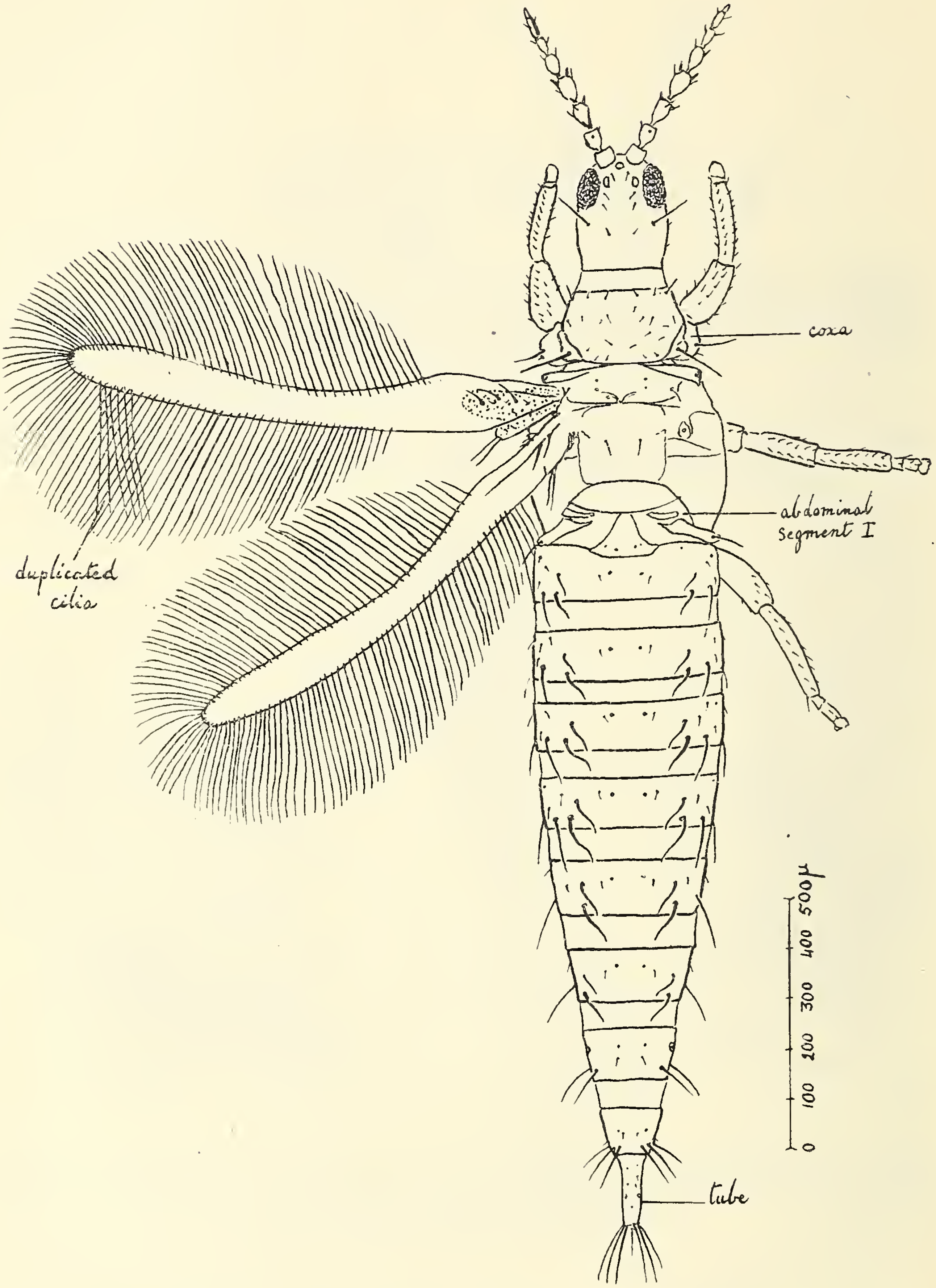

Fig. 12. *HAPLOTHRIPS KRAUSSEI* Priesner. ♀. Dorsal view

BRITISH MUSEUM NATURAL HISTORY
PRESENTED
14 JAN 1948

Supplement to The London Naturalist.

Thysanoptera of the London Area.

By Guy D. Morison, North of Scotland College of Agriculture,
Marischal College, Aberdeen.

Part II.

Key to British Genera and Species of Thysanoptera.

† Measurements in μ 0.001 mm.
‡ Found in the London Area.
* Months of the year when found on plants.
§ Plants named after Clapham's List (1946).

Sub-order *TEREBRANTIA*.

Super-family Aeolothripoidea. Family Melanthripidae.
Contains one genus only, *Melanthrips* Haliday.

1. Forewings uniformly dark greyish-brown except for paler area at base; antennae uniformly dark greyish-brown except for paler segment III 2
s. str. *Melanthrips* Haliday

Forewings hyaline with two dark cross bands, one at the middle and the other at the apex; antennae uniformly dark greyish-brown except for paler II-III and the ventral surface of IV ...
sub-gen. *Dichropterothrips* Priesner

♀♀ 1.1-1.7 mm. long .... *ficalbii* Buffa

2. Usually one preapical long hair on hind tibia (cf. fig. 13); eye length 64-78 ♀; antennal segment III 68-72 (28 width), IV 72 (26), VI 50-60 (24); midlateral bristle on pronotum 80-108. 1.2-2 mm. .... *fuscus* (Sulzer)

Usually two preapical long hairs on hind tibia (fig. 13); eye length 80-88; antennal segment III 76. IV 76-79 (26), VI 63-72 (22-25); midlateral bristle of pronotum 112. 1.6-2 mm. ....
gracilicornis Maltbaek

No preapical long hair on hind tibia; antennal segment III pale yellow shaded brown on distal margin; midlateral bristle of pronotum 68. 1.06 mm. .... *harrisoni* Bagnall

M. fuscus‡ (Sulzer). ♀♀ 5-9*. ♂♂ 5-6, larvae 6-9. Adults, larvae active, often numerous in S. England, Bucks, Cambs, Durham, Essex, Herts, Hunts, Middlesex, Norfolk, Northumberland, Oxon, Suffolk, Sussex, Wilts. Scarce in Kincardine and Aberdeen. Larval hosts include *Sinapis arvensis*§, *Brassica* spp., *Poterium sanguisorba*, *Galium aparine*. London: Epping Forest, Millhill, near Wraysbury.

M. gracilicornis‡ Maltbaek. Habits like those of *fuscus* of which it may be a variety. *Sinapis arvensis.* Kent, Middlesex, Wilts. London. near Wraysbury.

M. harrisoni Bagnall. Known from a single ♀ found in Kent on grass ?.

M. (*D.*) *ficalbii*‡ Buffa. ♀♀, ♂♂ 5-6. *Reseda lutea*, *Galium aparine*, *Malva rotundifolia*, and other plant species. Adults active, often numerous. Beds, Berks, Cambs, Hunts, Middlesex, Norfolk, Oxford, Suffolk, Surrey. London: Warlingham, near Wraysbury. From my collection of both sexes I consider *anglicus* Priesner a synonym of *ficalbii*.

Family AEOLOTHRIPIDAE.

Key to Genera.

Labial palpi 4-segmented. Antennae 9-segmented, segments VII-IX so closely united that they seem to form one segment (cf. fig. 10). Wings without cross bands, but may be reduced or absent .... *Rhipidothrips* Uzel

Labial palpi 4-segmented. Antennae 9-segmented, segments V-IX so closely united that they seem to form one segment (fig. 10). Wings with dark cross or long bands, but may be reduced or absent .... *Aeolothrips* Haliday

Rhipidothrips Uzel.

1. Antennal segment II light; prothorax light with dark central markings; femora light at base and apex; 6-8 pale hairs on hind margin of pronotum 2

   Antennal segment II dark; prothorax and femora uniformly brown like the rest of the body; 2 pairs of hairs on the hind margin of pronotum 3

2. Female head 200 (190); antennal segment III 100 (24.5), IV 80 (27); forewing 1050 (150 in middle); tibia III 295 (50); ♀ 1.4-2 mm. *gratiosus* Uzel

   Female head 182 (190); antennal segment III 80 (22), IV 59 (25); forewing 945 (128); tibia III 242 (47); ♀ length not stated ...... *uzelianus* Bagnall

3. Cheeks slightly curved outwards, with 3-4 short, stiff hairs pointing forwards on the side margins; tibiae indistinctly paler towards apices; tarsi pale brown. ♀ 1.6 mm. .... *brunneus* Williams

R. gratiosus‡ Uzel. ♀♀. ♂♂ 5-7. Grass, oats, flowering Dicotyledons. Seems scarce. Berks, Bucks, Oxon, Surrey, Wilts. London: Warlingham.

R. uzelianus Bagnall. Described from a female found in Switzerland. Bagnall remarks, "I have also the species from England."

R. brunneus Williams. Micropterous females and perhaps larvae from grass in Sussex. May.

Aeolothrips Haliday.

1. Female abdominal segments X-XI and hind part of IX reddish or yellowish 3
s. str. *Aeolothrips* Haliday

Abdomen uniformly dark, or in young specimens the middle is paler than the apex 2

2. Legs dark with at most the tarsi and fore tibiae paler 4
sub-gen. *Coleothrips* Haliday

Legs dark, with all tibiae yellow or white at the apices, and the tarsi the same pale colour 7
sub-gen. *Podaeolella* Priesner

3. Both sexes, prothorax whitish, abdominal segments II-III whitish; antennal segments I-III white with the apex of III lightly shaded brown. Both sexes macropterous, micropterous or apterous. Abdominal seg. IX of male without sickle-shaped hair on either side. ♀♀ 1.6-2 mm. .... *albicinctus* Haliday

Prothorax brown; abdominal segments III and often II yellowish-white in young and brown in old specimens; antennal segments II-III white with apex of III shaded brown. Both sexes macropterous. Abdominal segment IX of male on either side with a long sickle-shaped hair curved back and downwards. ♀♀ 1.5-1.8 mm. .... *ericae* Bagnall

4. Forewing hyaline, with two dark cross bands and a small dark area at base 5

Forewing hyaline with two dark cross bands which are united with one another by a dark band on the hind margin of the wing. Antennal segment III wholly white, IV clear near base. ♀♀ 1.4-1.8 mm. .... *melaleucus* Haliday

Forewing hyaline with a more or less broad, dark, cross band which is prolonged on the hind margin almost to the apex of the wing. Antennal segment I-II dark brown, III-IV yellowish or dirty white, IV at apex often indistinctly greyish, the other segments clear grey. Much red internal pigment. ♀♀ 1.5-2 mm. .... *vittatus* Haliday

5. Foreleg tarsus lacks triangular process on the ventral surface between the spine and the hook (fig. 11 A) 6

Foreleg tarsus bears a triangular process between spine and hook (fig. 14); antennae alike in both sexes; segment I dark brown. II dark brown, paler at apex, III pale brown in basal third. becoming darker to apex, IV-IX brown; sensory organ on III about half and on IV two-thirds the length of the segment (including pedicel); marginal vein at apex of forewing is colourless or only little darker than the hyaline membrane of the wing. No sclerotized processes seem present on abdominal tergites IV-VI of male and no pair of long curved hairs on the ventral surface of IX. ♀♀ 1.4-1.6 mm. .... *propinquus* Bagnall

6. Antennal segments I, IV-IX dark brown, II dark brown at base, slightly paler in apical quarter or third, especially in male. III whitish shaded with grey at apex; sensory organ on III about one-third to five-twelfths length of segment, on IV two-thirds to four-fifths length of segment; marginal vein of forewing hyaline at apex; male with a pair of sclerotized, dark processes on each of abdominal tergites IV-V and a pair of long curved hairs on the ventral surface of segment IX (fig. 11 C). Red internal pigment usually well developed. 1.5-2 mm. .... *fasciatus* Haliday

Antennal segments I, IV-IX dark brown, II brown at base, paler in apical half or three-quarters, especially in male, III yellowish shaded with grey at apex; sensory organ on III about one-third or quarter length of segment, on IV one-third to two-fifths length of segment; marginal vein of forewing brownish-yellow at apex; male with a pair of sclerotized, dark processes on each of abdominal tergites IV-VI (fig. 15) and a long sickle-shaped hair pointing downwards on either side of segment IX, and a pair of curved hairs on the ventral surface of the segment. Red hypodermal pigment scarce or absent. 1.6-2 mm. ... *tenuicornis* Bagnall

7. Forewing hyaline at the base and apex and with the middle concolorous grey. Body variable shades of brown, with red chromatophores. Antennal segments I-II grey, III-IV whitish, V grey, VI-IX clear grey. 1.1-1.9 mm. .... *versicolor* Uzel

The grey or brownish band of the forewing may be more or less divided by a hyaline area in forms of *versicolor*, such as *maculosus* Bagn., *costalis* Bagn.

Ae. albicinctus‡ Haliday. ♀♀ 5-9, ♂♂ 5-8, larvae 7-9. Larval hosts grass spp. Often common in southern half of England. London: City, Hyde Park and 6 other districts.

Ae. ericae Bagnall. (=*nobilis* Priesner). ♀♀ 6-8, ♂♂ 5-8, larvae 7-10. Larvae predacious on small Arthropoda. Larval hosts include *Achillea*, *Calluna*, *Erica*, *Galium verum*, *Lathyrus*, *Lotus*, *Sarothamnus*, *Ulex*. Devon-Sussex-Caithness and many intermediate counties. I have found it very close to London. Var. *mülleri* Priesner is a colour phase of some younger insects.

Ae. (*C.*) *fasciatus*‡ (L.). (=*intermedius* Bagnall). ♀♀, ♂♂, larvae 5-9. Common on many spp. wild and cultivated plants in England, scarce in Scotland, Kincardine to Ross. London: City, Acton, Hyde Park and 13 other districts. The synonymy of *fasciatus* and the other *Aeolothrips* was determined by comparing my collection with that of the British Museum (Nat. Hist.). The list of species and synonyms will be published at the end of this paper.

Ae. (*C.*) *tenuicornis*‡ Bagnall. (=*anthyllidis* Bagn., *clavicornis* Bagnall). ♀♀ 5-9, ♂♂ 4-9, larvae 6-9. In habits, numbers of plants frequented, distribution in London like *fasciatus*, with which it often occurs. Common in southern England. Occurs on Kincardineshire coast.

Ae. (*C.*) *propinquus*‡ Bagnall. Females on flowering plants spp. Larval hosts unknown. London: Warlingham, Woldingham and Purley Oaks. Also Herts.

Ae. (*C.*) *melaleucus*‡ Haliday. ♀♀ 5-8. Singly or in small numbers. Apparently scattered in England. London: Stoke Newington. I have taken it on ash, *Senecio*, *Oenothera*.

Ae. (*C.*) *vittatus* Haliday. ♀♀ 5-6, ♂ unknown, larvae 8. *Pinus sylvestris*, larval host. Scattered in England, Aberdeenshire.

Ae. (*P.*) *versicolor* Uzel. Females apparently scarce and scattered in England and S. Scotland. In Europe the larval hosts seem to include *Betula*, *Carpinus*, *Corylus*, *Quercus*, *Tilia*, *Ulmus*.

Sub-order *TEREBRANTIA.*

Super-family THRIPOIDEA. Family THRIPIDAE.

Key to Sub-families.

1. Upper surface of body more or less covered with distinct polygonal reticulations (fig. 16). Forewing with curved hind margin. Terminal antennal segments exceptionally long, often needle-like (fig. 16) .... Heliothripinae Karny
Heliothrips, *Hercinothrips*, *Helionothrips*, *Parthenothrips*
(*Hercothrips*, *Dictyothrips*, *Ctenothrips* not British)

Upper surface of body with some indication of polygonal reticulation (fig. 22). Body broad and flat. Forewing with straight hind margin (fig. 22). Head in front deeply concave ....
Dendrothrips, *Monochaetella* (*Dichaetella* not British)
Dendrothripinae nov.

Upper surface of body not covered with distinct polygonal reticulations, at most with confluent tranverse striae (figs. 2, 5, 17, 19). Forewings with curved hind margin. Terminal antennal segments not exceptionally long (cf. *Belothrips* British, *Rhaphidothrips* not Br.) 2

2. Body, particularly the abdomen, coated with microtrichia, which when dense give the insect a silvery sheen. Pronotum usually without particularly long bristles. Forewings with two long veins represented chiefly by chaetotaxy ....
Sericothrips, *Leucothrips*, *Drepanothrips*
Sericothripinae Karny

Body without coating of microtrichia. Pronotum with or without long bristles. Forewings with one or two long veins. Larvae varied in structure 3

3. Head in front of eyes produced into a broad triangular projection on which the antennae are inserted (fig. 17). Females usually macropterous, males micropterous or apterous. Forewings with two long veins. Body dorsoventrally flattened. Antennae 8-segmented .... Chirothripinae Karny
(*Chirothrips*, *Limothrips*, *Pruthiella* (*Idolimothrips* not Br.), *Iridothrips*

Head not produced in front of eyes. Both sexes generally alike in degree of development of wings. Forewings with one or two long veins. Body usually cylindrical. Antennae 6-9-segmented .... Thripinae Karny
Aptinothrips, *Anaphothrips*, (*Hemianaphothrips* not British). *Pseudoarticulella*, (*Rhaphidothrips*, *Prosopothrips* not Br.), *Belothrips*, *Oxythrips*, *Odontothrips*, (*Sminyothrips* not Br.). *Taeniothrips*, *Chaetanaphothrips*, (*Plesiothrips* not Br.), *Thrips*. *Stenothrips*, *Baliothrips*, *Platythrips*, *Bolacothrips*, *Tmetothrips*, *Frankliniella*, *Parafrankliniella*, *Kakothrips*, *Scolothrips*, *Euchaetothrips*, (*Sphaerothrips* not Br.).

Key to the Genera of British Thripidae.

Females and most males.

1. Body without microtrichia on the sides of the abdominal tergites 2
Body with microtrichia, at least on the sides of the abdominal tergites (fig. 21). Sericothripinae 9

2. Upper surface of body more or less covered with distinct polygonal reticulations (fig. 16). Heliothripinae 3
Upper surface of body with some indication of polygonal reticulations (fig. 22). Dendrothripinae 7
Upper surface of body not covered with distinct polygonal reticulations, at most with confluent transverse striae (figs, 2, 5, 17, 19) 11

3. Antennae apparently 9-segmented owing to false partition across segment VI .... cf. *Dendrothrips* Uzel
Antennae 8-segmented (style 2-segmented). Maxillary palps 2-segmented 4
Antennae 8-segmented (style 2-segmented). Maxillary palps 3-segmented .... cf. not British *Prosopothrips* Uzel
Antennae 7-segmented (style 1-segmented). Maxillary palps 2-segmented .... *Parthenothrips* Uzel

4. Head with raised transverse ridge near base. Pronotum with each lateral margin projecting as narrow ledge (fig. 16) 5
Head without raised transverse ridge near base. Pronotum without each lateral margin projecting as a narrow ledge 6

5. Forewings pale with two dark cross bands, apex pale; long bristles on costa, 1st and 2nd long veins. Legs brown and yellow ...... *Hercinothrips* Bagnall
Forewings pale brown with two paler cross bands, apex brown; bristles on costa and 2nd long vein; legs brown and yellow ...... *Helionothrips* Bagnall

6. Forewings pale, considerably broadened at base; no strong bristles on costa; legs pale yellow .... *Heliothrips* Haliday
Forewings dark, with two transverse lighter bands, apex dark; strong bristles on costa and 2nd long vein; legs banded brown and yellow .... not British *Hercothrips* Hood

7. Forewings with straight hind margin 8

Forewings with curved hind margin 11

8. Pronotum without strong bristles near hind angles. Antennae apparently 9-segmented owing to false partition across segment VI .... *Dendrothrips* Uzel

Pronotum with one strong bristle near each hind angle. Antennae 8-segmented .... *Monochaetella* Priesner

Pronotum with two strong bristles near each hind angle. Antennae 8-segmented .... not British *Dichaetella* Priesner

9. Antennae 6-segmented. Forewing with two long veins .... *Drepanothrips* Uzel

Antennae 8-segmented 10

10. Forewing with one long vein. Pronotum with two long bristles on posterior margin near each hind angle. Body pale yellow; microtrichia scanty; maxillary palps 2-segmented .... *Leucothrips* Reuter

Forewing with first long vein bearing 15-25 bristles and the second represented by 1 (rarely 2) bristles near apex, but wings often micropterous. Pronotum with 2 shorter bristles on posterior margin near each hind angle and 1 longer and stronger on either side nearer the middle line (fig. 20). Body dark in British species. Microtrichia very dense .... s. str. *Sericothrips* Haliday

Forewing with first long vein bearing fewer bristles and the second represented by 3-5 bristles evenly spaced along the whole of its length. Pronotum with two shorter bristles on posterior margin near each hind angle and one larger and stronger bristle on either side nearer the middle line. Body yellow. Microthrichia not so dense .... *Sericothrips longipennis* (Bagnall)

11. Head projecting in front of eyes (figs. 17). Chirothripinae 12

Head not or only projecting slightly in front of eyes (fig. 1). Thripinae 17

12. Head produced in front of the eyes into a broadly rounded projection upon which the 7- or 8-segmented antennae are inserted. Both sexes with various degrees of development of wings. Body flat 13

Head produced in front of eyes into a triangular projection upon which the 8-segmented antennae are inserted. Females usually macropterous, males micropterous or apterous. Body flat ... 14

13. Antennae 7-segmented. Pronotum with one long bristle on each side margin and two longer bristles on posterior margin near each hind angle .... cf. *Euchaetothrips* Bagnall

Antennae 8-segmented. Pronotum with one long bristle at each fore angle and two longer bristles on posterior margin near each hind angle .... *Iridothrips* Priesner

14. Abdominal segments VIII-X in female bearing 2-3 pairs of bristles which are shorter and much thicker than the long bristles (fig. 19) .... *Limothrips* Haliday

Abdominal segments VIII-X not bearing bristles which are shorter and much thicker than the long bristles 15

15. Fore tibia in both sexes exceptionally strongly developed and bearing a small hook on the exterior at the apex. Head small. Antennal segments III-IV each with a single sense cone (IV with forked sense cone in some European species) *Chirothrips*

Fore tibia in both sexes not exceptionally strongly developed. Head larger 17

16. Ovipositor very weak .... not British; cf. *Plesiothrips* Hood

Ovipositor strongly developed 11

17. Pronotum without any strong bristles 29

Pronotum with two strong bristles, one on hind margin near each hind angle 28

Pronotum with four strong bristles, two on hind margin near each hind angle 19

Pronotum with six strong bristles, one on front margin near each fore angle and two on hind margin near each hind angle ...... cf. *Iridothrips* Priesner

Pronotum with six strong bristles, one on each side margin and two on hind margin near each hind angle. (Antennae 7-segmented) .... cf. *Euchaetothrips* Bagn.

Pronotum with eight strong bristles, two on fore margin and two on hind margin near each angle 18

Pronotum with twelve strong bristles, two on front margin near each fore angle, one on each side margin and six along the posterior margin .... *Scolothrips* Hinds

18. Long pronotal bristles near fore and hind angles about equal in length .... *Frankliniella* Karny

The inner about twice as long as the outer pronotal bristle near each fore angle .... *Parafrankliniella* Priesner

The outer about twice as long as the inner bristle near each fore angle; abdominal segment VIII in male on either side with a short process curved backwards and upwards. The processes are reduced, but distinguishable in the female .... *Kakothrips* Williams

19. Fore tibia in both sexes usually bearing a curved tooth on the inner side at the apex. Rarely unarmed, but then the first long vein of the forewing set throughout its length with bristles. Antennae 8-segmented, VI with a broad lancet-shaped or scale-like sense cone .... *Odontothrips* Amyot & Serv.

Fore tibia unarmed. First long vein of the forewing rarely set throughout its length with bristles. Antennal segment VI with small sense cones 20

20. Antennae 8-segmented 21

Antennae 7-segmented 23

21. Antennal segments III and IV, each with a U-shaped sense cone 22

Antennal segments III and IV, each with single sense cone .... cf. *Bolacothrips* Uzel

22. Body yellow. Forewing with two wide, dark cross bands; first vein with about 3 distal bristles, second vein with about 4 bristles. Pronotal bristles rather short. Maxillary palps 3-segmented ... *Chaetanaphothrips* Priesn.

Body varies from pale yellow to brown to almost black depending on species. Forewings without two wide dark cross bands; chaetotaxy of wing veins different from above, but wings may be reduced or absent in one or both sexes depending on species. Pronotal bristles usually longer. Maxillary palps 3-segmented .... *Taeniothrips* A. & S.; cf. *Thrips* L.

23. Ovipositor very weak. Males differing from females in antennal structure .... not British; cf. *Plesiothrips* Hood

Ovipositor strongly-developed. Males and females alike in antennal structure 24

24. Maxillary palps 3-segmented 25

Maxillary palps 2-segmented 27

25. Antennal segments III, IV, each with simple sense cone .... *Bolacothrips* Uzel

Antennal segments III, IV, each with U-shaped sense cone 26

26. A long bristle on each side of pronotum; six fairly long bristles on head behind eyes; three long bristles on outer side of each tibia .... *Euchaetothrips* Bagnall

No extra long bristles on side of pronotum, behind eyes or on tibiae. Head broader than long .... *Thrips* L.

27. Abdomen not exceptionally broad in females. Forewing with a dark cross band, but females vary from macropterous to micropterous and males are micropterous. Without long bristles behind the eyes and on the tibiae ...... *Baliothrips* Uzel

Abdomen exceptionally broad in females. Forewing brown with strong brown bristles, but wings usually absent or reduced ...... *Platythrips* Uzel; cf. *Tmetothrips* A. & S.

Body narrow. Wings present, brown with slender bristles .... *Stenothrips* Uzel

28. Antennae 8-segmented. Abdomen neither very broad nor very dark. Macropterous, hemimacropterous, micropterous, depending on species ..... *Oxythrips* Uzel; cf. *Belothrips* Haliday

Antennae 8-segmented. Abdomen very broad and dark. Macropterous to micropterous .... *Tmetothrips* A. & S.

29. Ocelli absent. Wings absent. Body usually very narrow 30

Ocelli present but may be represented merely by spots of pigment. Wings present or reduced; when present they bear two long veins. Body broader 31

30. Antennae 6-segmented (no style) .... *Aptinothrips* Haliday

Antennae 8-segmented (style 2-segmented) *Aptinothrips* Haliday

31. Antennae 8-segmented. Style 2-segmented, shorter than segment VI. Wings usually present, at least in females. Abdominal segment X about as long as broad .... *Anaphothrips* Uzel

Antennae 8-segmented. Style 2-segmented, about as long as segment VI. Macropterous both sexes. Abdominal segment X almost twice as long as broad at widest ... *Belothrips* Haliday cf. *Oxythrips* Uzel

Antennae 9-segmented. Style 3-segmented. Macropterous. Abdominal segment X about as long as broad .... not British *Hemianaphothrips* Priesner

Antennae apparently 9-segmented owing to false partition across segment VI. Macropterous or micropterous. Abdominal segment X about as long as broad ... *Pseudoarticulella* Shumsher

Sub-fam. HELIOTHRIPINAE.

Heliothrips Haliday.

H. haemorrhoidalis‡ (Bouché) Greenhouse thrips. Body dark brown, apex of abdomen orange; antennae, legs, wings pale yellow. 1.2-1.7 mm. Pomeyrol (1928) showed that var. *abdominalis* Reuter is a young female that has yet to acquire the darker coloration characteristic of the species. In Britain a hothouse species breeding parthenogenetically on ferns and many spp. flowering plants. Practically cosmopolitan in distribution, breeding in the open in warm to hot countries between latitude 45 N. and 40 S. London: Chelsea.

Hercinothrips Bagnall.

Forewing brown, a clear area near the base, before the distal quarter and at the extreme apex. The clear areas very short and indistinctly limited. All tibia, tarsi and fore femur yellow. 1.2-1.5 mm. *femoralis* Reuter

Forewing light coloured with two dark brown bands. Fore femur and fore and middle tibiae more or less dark grey. 1.2-1.5 mm. .... *bicinctus* Bagnall

H. femoralis‡ (Reuter). Banded Greenhouse thrips. In Britain a hothouse species breeding on many spp. flowering plants. London: Kew.

H. bicinctus‡ (Bagnall). Smilax thrips. In Britain a hothouse species. Seems to favour Monocotyledons. London: Chelsea.

Helionothrips Bagnall.

H. errans‡ (Williams). (Fig. 16). Yellowish-brown; antennae yellow, II and VI brown, legs yellow and brown. 1.2-1.4 mm. In Britain a hothouse species, seeming to favour certain Orchids. London: Surbiton.

Parthenothrips Uzel.

P. dracaenae‡ (Heeger). Palm or Dracaena Thrips. Body yellowish-brown; antennae yellow with VI-VII brown; tibia and tarsi yellow; femora brown shaded yellow at base and apex; wings hyaline with brown reticulations on the membrane near the dark brown bases of the long veins and near the apical third where the veins are shaded brown.

1.2-1.3 mm. In Britain a hothouse species with males occurring in colder houses. Favours Liliaceae but breeds on other families flowering plants. London: Kew.

Sub-fam. CHIROTHRIPINAE.

Chirothrips Haliday.

1. Antennal segment II simple; females macropterous, males micropterous or apterous. ♀♀ 1.5-1.7 mm. .... *hamatus* Trybom

   Antennal segment II expanded into a process on the outside ... 2

2. Females micropterous, male unknown; antennal segment I larger, II shorter, with somewhat recurved process; 4-7 pairs of small hairs in front of the interocellar hairs; abdominal sternites with heavier sculpture and with heavy scallop-like thickenings (fig. 18), ♀♀ 1.1-1.4 mm. ... *molestus* Priesner *sensu* Hood 1938

   Females macropterous, males micropterous; antennal segment I smaller, II longer with straighter process; usually three pairs of small hairs in front of interocellar hairs (fig. 17); abdominal sternites with lighter sculpture and thickenings. 0.8-1.6 mm. .... *manicatus* Haliday

C. manicatus‡ Haliday. (Fig. 17.) ♀♀ 1-12, maximum numbers 5-7, ♂♂ 6-10, larvae 7-9. Larval hosts Grass spp. Often abundant. Adults sluggish except in hot sun. Larvae very flat, difficult to find. England. Wales. Scotland to at least Ross. London: City, Hyde Park and 21 other districts. I found it impossible to separate Bagnall's type female of *similis* from *manicatus*.

C. molestus Priesner *sensu* Hood 1938. May be the micropterous female of *manicatus*. It occurs fairly commonly on grass along the coast of Kincardine and Aberdeen. This is the first record of it from Britain. though Bagnall lists it in Kloet and Hincks (1943).

C. hamatus Trybom. ♀♀ 5, ♂♂ 5-7. Bagnall recorded a few females from Northumberland, Durham. Lancs. and Hants. I found 29 ♂♂ in Glos. and 28 ♀♀, 2 ♂♂ in Norfolk and it seems likely to occur in the London area on its larval host, *Alopecurus pratensis*.

Limothrips Haliday.

1. Antennal segment II symmetrical, III produced outwards in process or almost symmetrical; III bears simple or forked sense cone. IV with forked or simple sense cone; head usually more produced in front of eyes. In female at least one pair of extra stout bristles on each abdominal segment VIII. IX, X or VIII, X. (Fig. 19) 2
   s. str. *Limothrips* Haliday

   Antennal segment II produced outwards in process, III symmetrical, III-IV each with forked sense cone; head less produced in front of eyes. In female a pair of extra stout bristles on each of abdominal segments IX, X ....
   sub-gen. *Pruthiella* Shumsher; *L.* (*P.*) *angulicornis* (Jabl.)

2. Antennal segment III symmetrical, III and IV each with forked sense cone, II not strongly constricted at base; two pairs extra stout bristles on abdominal segment VIII, one pair on IX and one pair on X .... *schmutzi* Priesner

Antennal segment III produced slightly outwards near apex, III, IV each with simple sense cone; one pair extra stout bristles on each of abdominal segments VIII and X .... *cerealium* Haliday

Antennal segment III drawn into a process on the outside 3

3. Antennal segment III drawn into a prominent, acute triangular process on the outer angle, less marked in male; III with simple, IV with forked sense cone; VI about one-third longer than IV in females, about equal in length in males; postero-angular bristle of pronotum in female 55-78; stout bristle at side of abdominal segment IX of male about 50 long, not inserted in conspicuous papilla .... *denticornis* Haliday

Antennal segment III drawn into a less prominent process; VI little longer than IV; postero-angular bristle of pronotum shorter; extra stout bristle at side of abdominal segment IX of male is very short and inserted in conspicuous papilla ...... *incertis* Bagnall

L. denticornis‡ Haliday. (Fig. 19.) Grain or Corn Thrips. ♀♀ 1-12, ♂♂ 6-10, larvae 6-9, pupation on plant. Breeds on cereals, especially barley, also on various grasses. Often abundant, particularly in S.E. England. Over the rest of Britain probably scarcer than *cerealium*. Surrey, Wales, Ross and many intermediate counties. London: City, Stoke Newington and 7 other districts.

L. incertis Bagnall. Bagnall described the species from France and Spain on *Hordeum* and *Avena* and recorded 1 ♀ from Leith Hill, Surrey, 5/26.

L. cerealium‡ Haliday. Grain or Corn Thrips. ♀♀ 1-12, ♂♂ 6-11, larvae 5-11, pupation on plant. Larval hosts cereals and various grasses. Often abundant. Females migrate in large numbers July-August. Sussex, Wales, Sutherland and many intermediate counties and N. Ireland. London: City, St James's Park, Hyde Park and 18 other districts. I consider *minor* Bagnall a synonym of *cerealium*.

L. schmutzi Priesner. Bagnall recorded a female from Box Hill and another from Leith Hill, Surrey, 5/26.

L. (*P.*) *angulicornis* (Jablonowski). Bagnall recorded a female from Lincolnshire.

Iridothrips Priesner.

I. iridis (Watson). Formerly *Bregmatothrips*. Iris Thrips. Females macro-, hemimacro-, or micro-pterous, males apterous. Dark brown; antennae brown, III yellow, IV, V yellowish-brown; legs brown, tibia I, apices of other tibiae and all tarsi yellow; wings pale yellow. 1.5-1.7 mm. Breeds on *Iris pseudacorus* and certain cultivated spp. *Iris*. Bagnall records it from the Midlands, N. England, S. Scotland and as locally common in S. England. I found one micropt. female, Wraysbury, Middlesex, and two at Sutton Bonnington, Notts. Life-history in U.S.A. has been described. Females could probably be found all the year round, males summer and autumn with immature instars. In the field it may be confused with *Euchaetothrips kroli* and *Baliothrips dispar* which frequent similar habitats.

Sub-fam. SERICOTHRIPINAE.

Sericothrips Haliday.

1. Body dark coloured 2
Body yellow. (Sp. described in key to genera), 0.9 mm. long .... *longipennis* (Bagnall)

2. Both sexes macropterous or, usually, micropterous; pronotum has about 33-36 striae across middle line; abdominal tergite III with 10-12 cross rows of microtrichia; abdominal tergites completely coated with microtrichia; antennal segment III 2.5-3 times as long as broad. 0.9-1.2 mm. .... *staphylinus* Haliday

Both sexes micropterous; pronotum with about 48-50 striae across middle line; abdominal tergite III with 20-21 cross rows of microtrichia; abdominal tergites completely coated with microtrichia; antennal segment III about 3 times as long as broad. 1-1.3 mm. .... *bicornis* (Karny)

Both sexes macropterous; pronotum with about 36-41 striae across middle line; abdominal tergite III with 16-17 rows of microtrichia at the sides; tergites I-V with an area on either side of the middle line towards the base not coated with microtrichia; antennal segment III about 3.5 times as long as broad. 1.2-1.5 mm. .... *gracilicornis* Williams

S. staphylinus‡ Haliday (figs. 20, 21). ♀♀, ♂♂ 1-12, larvae 7-11, pupation on plant. Larval hosts *Ulex* spp. Common. Sussex, Sutherland and many intermediate counties. London: Oxshott, Epping Forest.

S. bicornis (Karny). ♀♀ 1-11, ♂♂ 3-11, larvae 8-9. Larval host *Lotus corniculatus* and perhaps other Legumes. Surrey, Kincardine, Aberdeen, Nairn.

S. gracilicornis Williams. ♀♀, ♂♂ summer. *Vicia cracca*, *Lotus* spp., *Lathyrus pratensis*. Sussex, Surrey, Oxford. These three species of *Sericothrips* often occur in large numbers on the host plants. Both sexes jump actively.

S. longipennis‡ (Bagnall). Formerly *Scirtothrips*. Begonia Thrips. A hothouse thrips in Britain, frequenting various species of plants. London: Chelsea.

Leucothrips Reuter.

L. nigripennis (Reuter). Pale yellow body, dark forewings; 0.9-1.1 mm. In Britain a hothouse species living on ferns. Glasgow, Newcastle-on-Tyne.

Drepanothrips Uzel.

D. reuteri Uzel. Grape or Vine Thrips. Body yellow shaded with brown; legs concolorous with body; wings concolorous greyish-brown; antennae dark grey-brown, with III paler and I hyaline. Male bears a pair of long dark, ribbon-like hairs on the sides of abdominal segment IX. ♀♀ 0.9-1.2 mm. ♀♀ 5-11, ♂♂ 8, larvae 8. Fairly common. Larval hosts include *Quercus robur*, *Corylus*, *Betula*, Vine. Surrey, Hants, Glos., Aberdeen, Moray, Nairn, Inverness.

Sub-fam. DENDROTHRIPINAE.

Dendrothrips Uzel.

1. Forewing almost uniform dark greyish-brown .... *degeeri* Uzel
Forewing hyaline with brown cross bands, one at base, one on either side of middle and a small one at tip 2
2. Relative lengths of dark and light areas of forewing from base (not in μ):
8, 8, 9, 7, 8, 4, 2.5 .... *ornatus* (Jablonowski)
7, 12, 8, 12, 7, 7, 2 .... *schillei* Bagnall

D. ornatus (Jablonowski). Body yellowish-brown; antennae short, yellowish-brown with II, VII-IX and apex VI darker; legs greyish-brown, tarsi yellowish. 0.9-1.1 mm. Bagnall recorded a "specimen" from Perthshire on lime. In Europe and U.S.A. the larval hosts include *Tilia*, *Syringa*, *Ligustrum*, *Alnus*.

D. schillei Bagnall may be a variation of *ornatus*. Bagnall found ♀♀ in Hants. on *Ligustrum*, 10/1929.

D. degeeri‡ Uzel. Body dark yellowish-brown; legs dark brown with tarsi yellowish; antennae dark greyish-brown, III-V paler, I palest. 1-1.2 mm. ♀♀ 5-9, ♂♂ 8-9, larvae 7. *Fraxinus* seems chief larval host; both sexes occur on it, *Tilia*, *Alnus*, *Corylus* and other trees. Seems locally common. Berks., Devon, Glos., Norfolk, Oxon, Surrey, Sussex. London: Romford.

Monochaetella Priesner.

Larger, ♀♀ 1-1.1 mm., ♂♂ 0.8-0.9 mm.; antennal segments VII, VIII in ♀, each 13-15; few dark spots on pronotum; ♀ four inner posteromarginal bristles of abdominal segment IX 60 ... *peucedani* Bagnall
Smaller, ♀♀ 0.7-0.8 mm., ♂♂ 0.6-0.7 mm.; antennal segments VII, VIII in ♀ each 9.5-10.5; W-shaped dark mark on pronotum; ♀ four inner posteromarginal bristles of abdominal segment IX 48 ... *saltator* (Uzel)

M. saltator (Uzel). Body pale yellow with grey shading; antennae dark grey with I, III, IV yellowish; legs yellow shaded grey; wings dark grey except for pale area near base. Bagnall recorded a female on Sallow near Lyndhurst, Hants. In Europe adults have been found on various species flowering plants and larvae on *Eupatorium cannabinum*.

M. peucedani (Bagnall). Very close to *saltator*. Bagnall recorded both sexes in profusion on *Peucedanum officinale* in Kent.

Sub-fam. THRIPINAE.

Aptinothrips Haliday.

1. Antennae 8-segmented (style 2-segmented) 2
   Antennae 6-segmented (no style) 2
2. Body colour pale yellow or brownish-yellow 3
   Body colour dark yellowish-brown, 1.1-1.5 mm. ... *nitidulus* Haliday
3. Antennal segment I with distal margin projecting as a sharp, vertical ridge, II broadest at the flat base above the short pedicel. with sides sloping towards apex; V almost parallel-sided. 1.1-1.5 mm. .... *elegans* Priesner
   Antennal segment I with distal margin sloping inwards, rounded, II broadest at middle and rounded at base above short pedicel, sides slightly curved outwards; V sides slightly rounded ... 4
4. Antennae 8-segmented. 1.1-1.5 mm. .... *stylifer* Trybom
   Antennae 6-segmented. 1.1-1.5 mm. .... *rufus* (Gmelin)

A. rufus‡ (Gmelin). Grass Thrips. Throughout British Isles on grass spp. All stages all the year round, but most numerous July-September. London: City and 24 other districts.

A. nitidulus Haliday is probably a variation of *rufus* as Speyer considers from its external morphology. The dark colour of adults and the orange colour of larvae is conspicuous in the field compared with the pale colours of the other species. Occurs under estuarine conditions along the coast on *Festuca rubra*, *Puccinellia* (*Glyceria*) *maritima* and other grasses. ♀♀ 1-12, ♂♂ 2-10, larvae 5-11. Likely to occur on the banks of Thames near exit from London area.

A. stylifer‡ Trybom. Grass Thrips. ♀♀ 1-12, ♂♂ 7-9, larvae 1-12. About as widely distributed in the British Isles as *rufus* but commoner in the north than in the south. The numbers of both sexes caught in Finland and the numbers of females recorded from Sweden seem to indicate that this is a northern species. Breeds on grass spp. but favours *Deschampsia caespitosa*, and *flexuosa*. London: E. Sheen, Epping Forest, Millhill, Oxshott.

A. elegans Priesner. On grass spp. Bagnall recorded 1 ♀ from S. Devon, 6/28.

Pseudoarticulella Shumsher.

Body and antennae dark brown, both sexes macropterous .... *badius* (Williams)

Body yellow, more or less shaded dorsally with brown; antennal segment I light. Females macropterous or micropterous .... *obscurus* (Müller)

P. obscurus‡ (Müller). Antennae greyish-brown, I hyaline or yellow, III, IV yellowish at base; legs yellow with brown shades; wings pale brownish-yellow. 1.1-1.5 mm. Male known only from 2 specimens found in Michigan, U.S.A., and very briefly described with no mention of wings. ♀♀ 1-12, larvae 5-11. Larval hosts grass and cereals. Common, occurring on a wide variety of habitats, but most frequently on *Holcus*, *Agrostis* on wet soil. Sussex, Caithness and many intermediate counties and in Wales and N. Ireland. London: City, Green Park and 11 other districts.

P. badius (Williams). Through the courtesy of Dr C. B. Williams I possess a ♀ paratype on which the comb of abdominal tergite VIII has hair-like teeth as in var. *pectens* Bagn. There is a close resemblance to *secticornis* Trybom, 1896, of which only apterous ♀♀, ♂♂ and larvae are described. ♀♀ 1-1.25 mm. Grass and *Carex*, Oxon.

Anaphothrips Uzel.

1. Body dark brown, paler in young individuals 2
Body yellow, with two dark brown, long stripes that start behind the eyes, are united on the thorax and occur as a dark patch on each of abdominal segments II-VII; antennae brown, with base and apex of III and base of IV, V paler; forewing pale greyish-brown with hyaline area near base and an indefinite darker cross bank near base of second vein. 1.1-1.4 mm. .... *orchidaceus* Bagnall

2. All tibia and tarsi yellow, the tibiae faintly shaded brown on outside and inside in the middle; forewing hyaline at base, then brown becoming paler towards apex 4
All tibiae and tarsi more or less dark yellowish-brown, with the fore tibiae and the bases and apices of the other tibiae paler; forewing concolorous yellowish-brown 3

3. Antennal segments I, II brown, II pale at base, III yellow, often shaded brown, IV grey-brown, VI-VIII dark brown; III about 0.3 longer than IV, V about 1.5 longer than broad, VI with ring-like constriction at base. 0.9-1.4 mm. ... *ferrugineus* Uzel
Antennae dark brown; III about 0.3 longer than IV, V 1.5-1.7 longer than broad, VI with ring-like constriction at base indistinct or absent. 1.1-1.4 mm. .... *silvarum* Priesner

4. Antennal segment I brown, II brown with paler apex, III yellow, IV slightly darker yellow, V-VIII dark brown; III very little longer than IV, about 3.5-4 times as long as wide. 1.1-1.5 mm. .... *tamicola* Bagnall

A. ferrugineus Uzel. Both sexes known from Europe on low herbage. Described here as it is likely to occur in Britain and to be confused with *silvarum*.

A. silvarum Priesner. ♀♀ 5-7, larvae 5-8. Often numerous on larval host, *Galium verum*. Bucks, Hants, Herts, Middlesex, Norfolk, Wilts, Inverness.

A. tamicola‡ Bagnall. ♀♀ 5-6, larvae 5-7. Apparently breeds only on *Tamus communis*, so limited by the distribution of this plant. Berks, Glos., Hunts, Notts, Oxon, York. London: Millhill, common in 1934.

A. orchidaceus‡ Bagnall. Yellow Orchid Thrips. In Britain a hothouse species, both sexes occurring on orchids. London: Kew.

Belothrips Haliday.

B. acuminatus Haliday. Body dark brown with orange or red internal pigment; antennae dark brown with base of III little paler; legs dark brown with tarsi and apices of tibia yellowish-brown; wings yellowish-brown, scarcely paler at base. 1.2-1.7 mm. ♀♀, ♂♂ 5-7, larvae 6-9. This species has not had its capture recorded in Britain since 1836, yet it is common in the northern half of Scotland and almost certainly it occurs in southern England on the larval host, *Galium verum*. Anatomically the red larvae are like those of *Anaphothrips* and *Oxythrips*. The adults should be compared with those of *O. brevistylis*.

Oxythrips Uzel.

1. Fore tarsus of both sexes with a small claw at the end of the last segment, most clearly seen in side view 2
   Fore tarsus unarmed 3
2. Body wholly yellow or yellowish-brown; abdominal sternites II-VII each bearing accessory bristles besides the row of 6 along the posterior margin. 1.1-1.4 mm. .... *ajugae* Uzel
   Head and pterothorax yellowish or reddish-brown with abdomen darker brown .... *ajugae* f. *bicolor* Uzel
   (Male with antennal segments III-VI a little shorter than those of some males of *ajugae*) .... *pernicis* Bagnall
3. Abdominal segment X ♀♀, long tubular, about 2.5 longer than the width at base 4
   Abdominal segment X ♀♀, normal structure 5
4. Head and thorax yellow, abdomen dark; abdominal sternites II-VII bearing accessory bristles. 1.1-1.4 mm. .... *brevistylus* (Trybom) i/
   Body wholly yellow .... *brevistylis* f. *hastata* Uzel
5. Body pale yellow; antennal segment VI 1.6 as long as V; bristles on fore part of body delicate .... *virginalis* Priesner
   Body orange yellow with cuticle pale brown in patches on the thorax and across the anterior margin of abdominal tergites I-IX; X brown at apex; antennal segments I-III pale yellowish-brown, I palest, II darkest in young ♀♀, and III darkest in old ♀♀, IV-VIII dark brown; legs yellow, lightly shaded brown on outsides of femora and tibia; forewings light brown, costa 27-29 bristles; body bristles dark brown seen against white paper; no accessory bristles on abdominal sternites. 1.0-1.3 mm. ...... *quercicola* Bagnall
   Young female like *quercicola* in colouration but distinguished by the pale brown of the entire abdominal cuticle; antennae brown, I palest, III and base of IV pale; legs yellow, shaded with brown particularly on the outsides, leaving the fore tibia and the apices and bases of all femora and those of the middle and hind tibia yellowish.
   Old females dark brown with head and thorax lighter yellowish or reddish-brown; *legs brown, paler than thorax*; antennae uniformly dark brown; forewing pale brown, costa 22-25, 2nd vein

7-9 bristles of moderate length tapering gradually to tips; no accessory bristles on abdominal sternites. 1-1.5 mm. .... *ulmifoliorum* (Haliday)

Colouration like dark *ulmifoliorum* female; accessory bristles present on abdominal sternites; bristles on forewing short, stumpy 14-20μ long; posteroangular pronotal bristle 58μ. 1 mm. ...... species ?

Colouration like dark *ulmifoliorum* female; accessory bristles present on abdominal sternites; wing vein bristles long; interocellar bristle 40, posteroangular pronotal bristle 60. 0.96 mm. ... species ?

Macropterous, hemimacropterous or micropterous females, males unknown. Brown cuticle with internal yellow colouration; *legs brown, dark as thorax*; no accessory bristles. Young female has pterothorax yellowish internally, antennae greyish-brown, III little paler; legs with yellowish-brown shading bases of femora, apices and bases of tibiae, tibia I palest. Old females concolorous dark brown with yellow tinge in pterothorax and apices of fore tibiae; wings greyish-brown. costa 23, 2nd vein 9-12 bristles. 1-1.5 mm. .... *halidayi* Bagnall

Owing to the anatomical uniformity of the females I have had to rely on colouration for many of the specific characters. The males are yellow more or less shaded with brown. The II instar larvae of *ajugae*, *brevistylis*, *quercicola*, *ulmifoliorum* and *halidayi* are easily distinguished.

O. ajugae‡ Uzel. ♀♀ most numerous 5-7, but may be found throughout the year, ♂♂ 4-6, larvae 5-7. Larval host, *Pinus sylvestris*. *P.* spp., particularly amongst male cones. Adults often abundant on herbage under pines. *O. flavus* Morison is a gynandromorph of *ajugae*, in which sexual abnormalities are quite common, at least in N.E. Scotland; f. *bicolor* Uzel is a colour phase of some young females. Bucks. Norfolk, Northumberland, Oxford, Surrey, Kincardine to Sutherland. London: Oxshott.

O. pernicis Bagnall. One male on *Salix*, Leith Hill, Surrey, 2/5/26. The description is inadequate to classify the species.

O. brevistylis (Trybom). ♀♀ 4-6, but some may be found throughout the year, ♂♂ 2-6, larvae 5-7. Larval host, *Pinus sylvestris*. *P.* spp. particularly amongst male cones. Often occurs in large numbers with *ajugae*, but appears earlier in the year and seems more northern or alpine in distribution. *O. hastata* Uzel is a colour phase of some young females. Durham, Northumberland, common Kincardine to Caithness and almost certain to occur on pines in the London area.

O. quercicola Bagnall. ♀♀ 5-11, ♂♂ (undescribed) 8, larvae 6-9. Larval host, *Quercus robur* leaves. Locally common. Durham, Berwick, Perth, Aberdeen, Ross.

O. ulmifoliorum‡ (Haliday). ♀♀ 1-12, ♂♂ 7-10, larvae 5-9. Larval hosts *Ulmus glabra*, *U.* spp. leaves. I have found adults on 17 other species of flowering plants, including oak and ash. Common. Sussex. Sutherland and many intermediate counties. London: Millhill.

O. halidayi Bagnall. ♀♀ 1-11, larvae 7. Larval host, *Fraxinus excelsior* leaves. Females often on herbage under ash trees. Fairly common. Devon, Hants, Surrey, Warwick, Kincardine to Sutherland.

O. virginalis Priesner. Both sexes found on grass, cereals, herbage. Larval hosts unknown. Bagnall records from Berks., Berwick, Northumberland. I am not certain of my record from Aberdeen. The specimen is in the National Collection.

O. spp. Two spp. each apparently nov. mentioned in the key but not named or described adequately, since I found only one female of each species and I don't know the larval hosts. Aberdeenshire.

Odontothrips Amyot et Serville.

1. Fore tarsus with a pair of small hooks on the ventral surface of the 2nd segment. (Tarsal hooks and tibial claws are most clearly seen in side view) 5

   Fore tarsus without hooks 2

2. Fore tibia at the apex with one large claw and a small stumpy projection bearing a bristle. Forewings greyish-brown with a lighter brown or hyaline transverse area near the base and another before the apex; 1st vein of forewing with about 4-8-2 bristles 3

   Fore tibia at the apex with two larger claws, of which the outer is a little larger than the inner. Forewings greyish-brown with a hyaline transverse area near the base and a paler brown area between middle and apex in younger insects; 1st vein with about 4-15-17-2 bristles 4

3. Large downcurved claw on outside and projection with bristle on inside of apex of fore tibia. Male with a small, dark, upturned prong at each posterolateral angle of abdominal tergite IX, and with the middle of the hind margin of each of abdominal sternites IV-VII projecting backwards as a small circular plate. 1.4-1.7 mm. .... *phaleratus* (Haliday)

   Large claw, straight at base and curved down near apex, on outside (?) and stumpy process on inside (?) of apex of fore tibia. Male abdominal sternites without projections. 1.5-1.7 mm. ... *intermedius* (Uzel)

4. Antennal segment III 66-72 (29), IV 64-70 (27), VI 62-64 (25); 1st vein usually 4-15-2 bristles; hind tibia 210-240 long, claws on fore tibia, outer 26, inner 15 long. Male with each posterolateral angle of abdominal tergite IX projecting upwards as a strong, dark prong. 1.4-1.8 mm. .... *cytisi* Morison

   Antennal segment III 69-78 (26), IV 69-78 (26), VI 69-75 (26); 1st vein usually bears 4-17-2 bristles; hind tibia 225-275 long; claws on tibia, outer 32, inner 16 long. Males without prongs on tergite IX. 1.4-2 mm. .... *ulicis* (Haliday)

5. Fore tibia at the apex with two large claws of which the outer is a little larger than the inner 6
Fore tibia at the apex with a large claw on the outside and a stumpy process on the inside bearing a hair 7
Fore tibia at the apex with a minute claw on the outside and a minute process on the inside bearing a hair 8
Fore tibia without claws 9

6. Body large, 1.6-2 mm., very dark brown; wings dark brown except for paler area near base; antennal segment IV yellowish-brown, III, tibia I and all tarsi yellow shaded with brown; 1st vein 4-16-2 bristles; male without prongs on abdominal tergite IX .... *uzeli* Bagnall

7. Body 1.5-1.7 mm., dark brown; wings dark brown except for hyaline area near base; antennal segment III yellow, IV, fore tibia and all tarsi yellow shaded with brown; 1st vein 4-10-12-2; antennal segment III longer than or equal to IV and to VI. Male with each posterolateral angle of abdominal tergite IX forming a dark, dagger-shaped process 20 long ... *loti* (Haliday)
Like *loti*, but with antennal segment III 65 (25), IV, VI 60 (23); 1st vein 4-11-15-2 bristles; longest bristles on abdominal tergite IX 160, X 145. Male with each posterolateral angle of abdominal tergite IX forming a black, tooth-like process ...... *quadrimanus* Bagnall
Like *loti*, but antennal segment III 81 (30), IV 75 (28), VI 67 (26); 1st vein 4-16-2 bristles; longest bristles of abdominal tergite IX 175, X 160 .... *thoracicus* Bagnall

8. Body 1.4-1.7 mm.; dark brown; wings dark brown except for hyaline area near base; antennal segment III yellow, IV brown, paler than V-VIII; fore tibia, all tarsi yellow, shaded with brown; 1st vein 4-12-18-2 bristles. Male with each posterolateral angle of tergite IX forming a dark process 18 long, pointing upwards .... *meridionalis* Priesner

9. Male 1.3 mm. long; brown; wings grey-brown except for a short pale area near base. Antennal segment III and all tarsi yellow; fore tibia yellow lightly shaded with brown; 1st vein 4-15-2 bristles; abdominal tergite IX with each posterolateral angle forming a toothlike process 20 (13); antennal segment III 68 (23), IV 61 (22), VI 59 (20) .... *inermis* Bagnall

Karny designated *phaleratus* (Haliday) the type species of *Odontothrips* Amyot and Serville, but I consider that the type should have been *ulicis* Haliday. Adults of the genus are comparatively easy to classify from structural characters, some of which have been described above, and others lie in the shape and size of antennal segments III, IV and the chaetotaxy of the wings and the IX abdominal segment in males. Priesner (1926) described the claw on the fore tibia in *intermedius* and *meridionalis* as placed on the inside, but this seems an error. The British species should be revised from the specimens in the collection of the British Museum (Natural History).

O. phaleratus‡ (Haliday). ♀♀, ♂♂ 5-9, larvae 5-10. Larval hosts, *Lathyrus pratensis, Vicia cracca, V. sepium.* Common. Sussex, Caithness and many intermediate counties, Wales, Antrim. London: Mill-hill.

O. intermedius (Uzel). Bagnall recorded a female from *Lathyrus montanus* in Perthshire.

O. cytisi Morison. ♀♀ 3-7, 10, ♂♂ 3-6, larvae 6-7. Larval hosts *Sarothamnus scoparius, S.* spp. Common. Norfolk and 11 counties in Scotland.

O. ulicis‡ (Haliday). ♀♀, ♂♂ 1-7, 9-12, larvae 5-7, 10. Larval hosts *Ulex* spp. Common. Sussex, Caithness and many intermediate counties. London: Kew.

O. uzeli Bagnall. ♀♀, ♂♂ 6-8, larvae 7-8. Larval host, *Vicia cracca* and probably other legumes. Common. Sussex, Inverness and various intermediate counties

O. loti‡ (Haliday). ♀♀ 5-9, ♂♂ 5-8, larvae 6-7. Larval hosts *Lotus* spp., *Anthyllis.* Common. Sussex, Nairn and many intermediate counties. London: Sunnymeads. I cannot separate *anthyllidis* Bagnall from *loti* on the characters described by Bagnall and I have females caught on *Anthyllis* when he and I collected thrips at Nigg, Kincardine, where *loti* is common.

O. quadrimanus Bagnall. Bagnall found both sexes on *Ononis spinosa* in Tankerton, Kent, 5/31. The species is inadequately described.

O. thoracicus Bagnall. Known from one female found on *Ononis*, 8/29, Wilts. The species is inadequately described. Bagnall has not described the claw(s) on the fore tibiae, but he writes that the species comes in the *loti* section, therefore I have placed it in that section, but if it has two large claws, it is probably *uzeli* Bagnall.

O. meridionalis‡ Priesner. Under this name I place *ignobilis* Bagn. and *mutabilis* Bagn. since it is impossible to recognise these species from their descriptions, and since I have a long series of both sexes and larvae from southern England, which correspond with Priesner's description of *meridionalis* and adults vary sufficiently to include Bagnall's two species. ♀♀ 5-10, ♂♂, larvae 8-9. Larval hosts *Ulex* spp., *Melilotus alba.* Common. I have found it in Berks, Bucks, Devon, Essex, Surrey, Sussex. London: Epping Forest, Oxshott, Stoke Newington.

O. inermis Bagnall. Described from one male on *Ulex* in Cheshire, 25/8/25.

Taeniothrips Amyot et Serville.

1. Both sexes macropterous; males usually paler than females, but like them in antennae, wings and chaetotaxy except for bristles on terminal abdominal segments; comb on abdominal tergite VIII present in female and in male of type species 2
s. str. *Taeniothrips* A. & S.

Females dark brown, macropterous, males brown or yellow, macropterous or apterous; female antenna 8-segmented, VI about as long as III; male antenna 8- or 6-segmented, VI as long as the

combined lengths of the other segments in *consociatus*; comb of abdominal tergite VIII present in both sexes; maxillary palps, female 3-, male 3- or 2-segmented ....
sub-gen. *Rhopalandrothrips* Priesner

Both sexes brown, macropterous, antennae 8-segmented ....
consociatus (Targioni-Tozzetti)

Females dark brown, macropterous, males orange or reddish, apterous; antennae with intermediate segments short and rounded; head small, wider than long, shorter than the pronotum and its width is about one-third that of pronotum at base; no comb; apex of abdomen in female pointed ....
sub-gen. *Amblythrips* Bagnall
ericae (Haliday)

2. Eyes strongly protruding; cheeks strongly curved outwards ... 3

Eyes not strongly protruding; cheeks slightly curved outwards ... 4

Eyes not strongly protruding; cheeks almost parallel or converging to base of head 11

3. Brown; last segment of tarsus with claw; forewings pale brown with darker cross area before middle and at apex and paler at base; antennal segment III scarcely paler than others which are greyish-brown. 1.2-1.7 mm. .... *inconsequens* (Uzel)

Dark brown; tarsus unarmed; forewings brown with darker cross area before middle and at apex and hyaline at base; antennae dark brown, III yellowish. 1.5-1.8 mm. ... *picipes* (Zetterstedt)

Orange yellow; wings concolorous pale yellow ...... *flavus* (Bagnall)

4. Orange yellow. A *Thrips flavus* with an extra segment in the style .... *flavus* (Bagnall)

Orange yellow; wings pale yellow with a brown cross band at base and at middle .... cf. *Chaetanaphothrips orchidii* (Moulton)

Yellow, with areas of cuticle shaded more or less with brown or grey, and, at least, the end of the abdomen dark in females 5

Brown in various shades 5

5. First vein of forewing bears 6-13 bristles on distal half 6

First vein of forewing bears 3 (4-6) bristles on distal half 7

First vein of forewing bears 2 bristles on distal half 12

6. First vein of forewing with 8 (6-13) bristles on distal half; wings dark brown, paler at base; antennae concolorous dark brown; male without comb on abdominal tergite VIII; accessory bristles present on abdominal sternites II-VII. 1.3-1.8 mm. ...
atratus (Haliday)

First vein of forewing with 6-7 distal bristles; forewings paler brown; antennae brown with III yellow. 1.3-1.7 mm. ....
montanus Priesner

First vein of forewing with 6-7 (6-9) distal bristles; forewings dark grey with hyaline base; antennae brown, III yellow, IV greyish-brown with yellow base, V often yellow at base. 1.2-1.9 mm. ...
annulatus (Karny)

7. Comb on abdominal tergite VIII complete across middle 8

Comb on abdominal tergite VIII incomplete in middle 10

Comb on abdominal tergite VIII absent .... cf. *Amblythrips ericae* (Hal.)

8. Body pale yellow .... 9 *trybomi* (Karny)

Body dark brown 9

9. Antennal segment III about 3 times as long as broad, longer than VI, like IV vase-shaped, constricted into a neck before the apex; III pale yellowish-brown, IV brown, other segments dark brown; wings pale yellowish-brown; accessory bristles on abdominal sternites III-VII; no comb in male. 1.3-1.8 mm. ... *vulgatissimus* (Haliday)

Antennal segment III like IV not vase-shaped, but with sides sloping gradually from the most expanded portion to the apex; antennae dark brown, I-IV yellow with I, II, IV faintly shaded brown. 1.3 mm .... *trybomi* (Karny)

10. Comb on VIII sometimes only very slightly incomplete in middle; antennal segment III 54, IV 48, VII plus VIII 16-18; antennae brown, II pale at apex, III yellowish, IV pale at base; cheeks strongly curved outwards; posterior margin of pronotum with 6 bristles between the long posteroangular bristles; forewings hyaline, slightly browned in distal portion. Male orange-yellow. 0.8-1 mm. .... *pini* (Uzel)

Comb not developed in middle; antennal segment III 49, IV 44, VI 66, VII plus VIII 25; antennae light brown with III colour undescribed, IV, V basally paler; cheeks not described; pronotum with 6 posterior inner bristles; forewing greyish yellow. 1.3 mm. .... *inaequalis* (Bagnall)

11. Comb not developed in middle; antennal segment III, IV, each 30-40, VII plus VIII 20-22, III-VI yellow, at least at bases; pronotum with 8 posterior inner bristles; forewings brown; no accessory bristles on abdominal sternites. 0.9-1.2 mm. .... *frici* (Uzel)

12. Abdomen dark brown, head and thorax yellowish-brown; antennal segment I grey, II, V-VIII dark grey, III yellow, occasionally shaded brown, III 40, IV 40 long; postocular bristles small except one clear pair behind eyes. Comb in female. 0.9-1.4 mm. .... *salicis* (Reuter)

Body yellow to dark brown; antennae dark brown, I, III, base of IV yellowish-brown; III 50, IV 41 long; bristles, interocellar 60, postocular inner, dark 30-32, outer 47, pronotal posteroangular 67-75; bristles on hind vein of forewing shorter than the spaces separating them; comb in both sexes; no accessory bristles. 1.1-1.4 mm. .... *propinquus* (Bagnall)

Body pale creamy yellow; antennal segments I, III clear greyish-yellow, II, IV base lighter, V-VIII greyish-brown; III 42, IV 37 long; bristles, interocellar 47, postocular inner 27, outer 37, pronotal posteroangular 42-45; bristles on hind vein of forewing longer than the spaces separating them; comb not described. 1.0-1.1 mm. .... *latus* (Bagnall)

Body and antennae brown ... cf. *Rhopalandrothrips consociatus* T.T.

T. picipes (Zetterstedt). ♀♀ 3-9, ♂♂ 3-8, larvae 5-9. Larval hosts include *Armeria*, *Cochlearia*, *Geranium*, *Hypericum*, *Lotus*, *Primula*, *Stellaria*, *Teucrium*. Often common. Sussex, Caithness and many intermediate counties, Wales, N. Ireland.

T. inconsequens‡ (Uzel). Pear Thrips. ♀♀ 4-6, 11, ♂♂ 5, larvae 5-6. Larval hosts include *Acer*, *Prunus*, *Pyrus*, *Malus*. Common. Cambs., Herts, Middlesex, Norfolk and other counties in England. Aberdeen, Banff, Kincardine, Moray, Inverness, Sutherland and a county in the south of Scotland. London: Millhill.

T. flavus (Bagnall). Bagnall recorded a female from Durham and a male from Cheshire.

T. atratus‡ (Haliday). Carnation Thrips. ♀♀ 1-12, ♂♂ 5-11, larvae 5-10. Larval hosts include *Spergula*, *Lychnis*, *Silene*, *Statice*, *Cerastium*, certain Labiates and Compositae. Common to abundant in the British Isles. London: City and 18 other districts.

T. montanus Priesner. Bagnall recorded a female and a male in *Scabiosa* in Lancs.

T. annulatus (Karny). Bagnall recorded 3 females from Cheshire.

T. trybomi (Karny). May be a variety of *vulgatissimus*. Bagnall recorded a female from Devon.

T. vulgatissimus‡ (Haliday). ♀♀ 1-12, ♂♂ 5-11, larvae 4-10. Larval hosts include *Brassica*, *Beta*, *Rumex*, *Prunus*, *Pyrus*, *Salix*, *Lathyrus*, Umbelliferae. Common to abundant in British Isles, more numerous in Northern Scotland than in southern England. London: City and 9 other districts.

T. pini (Uzel). Bagnall recorded females from Lancs and Perthshire. In Europe adults have been found on *Pinus*, *Abies*, *Picea* and some deciduous trees.

T. inaequalis (Bagnall). Bagnall describes two females from flowers of *Tamus* in Yorks.

T. frici (Uzel). Bagnall recorded a female from Devon and another from Sussex. It is associated with *Taraxacum*, *Leontodon* and other Compositae. It resembles *Thrips physapus*.

T. salicis (Reuter). Recorded by Bagnall in Kloet and Hincks (1943) but he gives no British record in his papers on the species. I found 1 ♀ on *Salix* in Northumberland.

T. latus (Bagnall). Bagnall described one female from *Scabiosa* in Northumberland.

T. propinquus‡ (Bagnall). ♀♀ 1-12, ♂♂ 6-9, larvae 6-10, pupation on host. Larval host, *Betula* spp. leaves. Common, at least in the northern half of Scotland. London: Oxshott, Epping Forest. The measurements for this species and *latus* are those given by Bagnall for the type females. My measurements of *propinquus* females show a fair variation.

T. (*R.*) *consociatus*‡ (Targioni-Tozzetti). ♀♀, ♂♂ 7-9. On *Rubus, Ulex, Erica, Calluna, Quercus.* Priesner found larvae on *Betula* in Europe. Quite common at least in Berks., Bucks., Essex, Surrey. London: Oxshott, Epping Forest, Warley.

T. (*A.*) *ericae*‡ (Haliday). ♀♀ 1-12, ♂♂ 3-11, larvae 1-12, pupae 4-9. Larval hosts, *Calluna, Erica* spp. The species is common and its distribution in the British Isles is probably as wide as that of its host plants. I have found it in Sussex, the Shetland Islands and many intermediate counties. London: Oxshott, Epping Forest, Burgh Heath.

Chaetanaphothrips Priesner.

C. orchidii (Moulton). Antennae yellow, VII, VIII and apices IV-VI shaded brown. 1-1.2 mm. In Britain a hothouse species breeding parthenogenetically on many species of plants.

Thrips Linn.

1. Body brown to yellow-brown, never wholly yellow; apex of abdomen always dark. Thorax usually more yellowish or reddish-brown than abdomen 2

Body bicoloured: head and thorax lemon or orange-yellow, abdomen dark brown. (Compare also under 2) 17

Body dark or pale yellow. The thicker cuticle may be shaded grey or brown, but, if so, the apex of the abdomen is yellow 23

2. Macropterous 3

Hemimacropterous or micropterous 20

3. First vein of forewing normally bears 3 (rarely 2) bristles on distal half 4

First vein of forewing normally bears 4 bristles on distal half ... 18

First vein of forewing normally bears 5-12 bristles on distal half 19

4. Sides of head converging strongly to base (Fig. 1) with cheeks slightly curved outwards. Body very dark brown in old specimens, yellowish-brown in younger; antennal segment III yellow, IV-VI usually yellow at base, others dark brown; wings dark brown with strong dark bristles. Male with a transverse elliptical, pale area on each of sternites III-VII. 1.1-1.9 mm. ... cf. also *validus, fuscipennis, viminalis.* *physapus* L.

Sides of head not converging strongly to base; cheeks more or less curved outwards 5

5. Abdominal sternites III-VII, each bearing accessory bristles besides the row of 6 bristles near the posterior margin 6

Abdominal sternites without accessory bristles 8

6. Fore tarsus bears a curved claw on the inside at the apex of the first segment; head about 1.3 broader than long, with strongly curved cheeks 1.1-1.6 mm. .... *calcaratus* Uzel

Fore tarsus without claw 7

7. Body blackish-brown, large; cheeks converging to base; pronotal posteroangular bristles 80-90 long .... *physapus* L.

Body yellowish-brown, smaller; cheeks not converging to base, posteroangular bristles 43-57 long. 1.2-1.4 mm. .... *praetermissus* Priesner

8. Body, antennae and wings dark brown; antennal segment III yellow, IV, V yellow at base, V shorter than II with sides rounded. Male with a small circular pale area on each of sternites III-VII. 1.0-1.6 mm. .... *validus* Uzel

Characters otherwise than above 9

9. Body dark brown, squat, abdomen broad 10

Body brown, more elongate, abdomen narrow 11

10. Antennal segment III shorter than VI, swollen abruptly ventrally and dorsally above pedicel, then contracting to apex, yellowish-brown; IV, V dark brown like other segments; pronotal posteroangular bristles about equal in length, 94. 1.1-1.5 mm. ...... *dilatatus* Uzel

Antennal segment III about equal in length to VI, not swollen dorsally, almost as dark brown as the other segments; pronotal posteroangular bristles, inner 50, outer 60 in micropterous females. 1.1-1.5 mm. .... *funebris* Bagnall

Antennal segment III longer than VI, yellow, IV, V brown, paler at base; cheeks strongly curved outwards, eyes projecting; pronotal posteroangular bristles 90-110. 1.4-1.6 mm. .... *klapaleki* Uzel

Antennal segment III little longer than VI, lemon yellow; pronotal posteroangular bristles 45-48. 1.3 mm. .... *paluster* Reuter

11. Head 1.4-1.8 broader than long 12

Head 1.1-1.3 broader than long 16

12. Comb absent on abdominal tergite VIII or represented by weak triangular teeth 13

Comb represented by few teeth on either side 14

Comb complete across middle 15

13. No comb. Antennae dark brown, III yellow, IV and base V pale: forewings blackish-brown except for hyaline area near base: 3 setae along side margin of abd. tergite II and 2 on abd. sternite I. 1.1-1.4 mm. .... *sambuci* Heeger

Comb represented by few weak serrations on either side. Antennae dark brown, III, IV and base II yellowish. 1.2-1.4 mm. .... *riminalis* Uzel

Characters too inadequately described to include in key .... *menyanthidis* Bagnall

14. Antennae brown, III, IV yellowish-brown, scarcely paler than others; forewings dark greyish-brown, paler but not hyaline at base; 4 setae along side margin of abd. tergite II and 2 on sternite I. 1.2-1.6 mm. .... *fuscipennis* Haliday

Antennae pale brown, III and base of IV paler than rest; forewings pale yellowish-brown; 3 setae along side margin of abd. tergite II and none on sternite I. 1.1-1.5 mm. ...... *major* Uzel

Antennae brown, I, II yellowish, III yellow, IV, V yellow at base; forewing pale yellowish-brown; 2 bristles on distal half of fore vein. 1-1.2 mm. .... *difficilis* Priesner

Antennae brown, III and base IV little paler yellow-brown; fore-wings concolorous pale yellowish-brown; 3 setae along side margin of abdominal tergite II, and 2 on sternite I. 1.1-1.3 mm. ... *junipericola* n.n. for *juniperina* Bagn. nec Linn.

15. Antennae brown, III, IV base II yellowish; wings pale yellowish-brown; 3 setae along side margin of abd. tergite II. 0.8-1.2 mm. .... *euphorbiae* Knechtel

16. Antennae dark brown, III paler; pronotal posteroangular bristles half length of pronotum; legs yellow shaded dark brown; wings concolorous greyish-brown. 1.1-1.6 mm. ...... *biformis* Bagnall

Antennae dark brown, III, bases IV-VI yellow; pronotal posteroangular bristles 2/3-3/4 length of pronotum; legs pale yellow; wings brown, paler at base. 1.2-1.5 mm. ...... *fulvipes* Bagnall

Head and thorax orange-yellow, abdomen greyish-yellow, last two segments dark grey; legs yellow; antennal segment I greyish-white, II greyish-yellow, III lighter yellow to grey-brown, IV colour not described, V-VII grey brown; macropterous. 1-1.1 mm. .... *paludosus* Bagnall

17. Antennae dark brown, bases III-V yellowish-brown; legs yellow, slightly shaded brown; wings concolorous pale brownish-yellow; abd. tergite VIII with weak serrations in place of comb teeth; abd. sternites III-VII without accessory bristles. 1.1-1.3 mm. .... *discolor* Haliday

Antennae, I, II yellow brown, III yellow, V-VII dark brown; legs yellow, lightly shaded brown; wings dark brown, paler at base; VIII tergite with comb across middle; sternites III-VII with accessory bristles. 1.1-1.3 mm. .... *hawaiiensis* Morgan

18. Antennae yellowish-brown, I pale yellow, basal halves of III-V pale yellowish-brown; ocellar crescents greyish-yellow (greyish red in most other spp.); pronotal posteroangular bristles 33-45 long; tergite VIII bears comb complete across middle. 1-1.3 mm. ... *tabaci* Lindeman

19. Abdominal sternites II-VII bearing accessory bristles besides the posterior row of 6; antennae brown, III paler, yellowish; legs dark brown with fore tibiae and all tarsi yellow, shaded brown; 4 pairs of hairs on hind margin of pronotum between posteroangluar long bristles. First vein has 3-6 distal bristles. Teeth of comb on tergite VIII often in groups of 3 or 4. 1-1.3 mm. ... *angusticeps* Uzel

Abdominal sternites III-VII bearing accessory bristles; antennae brown, III paler, yellowish; legs yellowish-brown; 3 pairs hairs on hind margin of pronotum between long bristles; 1st vein bears 7-13 distal bristles. Comb complete, with teeth separated. 1.1-1.3 mm. .... *minutissimus* L.

20. Body wholly dark ... 21
Bicoloured, head and thorax yellow, more or less shaded brown. abdomen dark brown ... *discolor* Haliday

21. Abdominal sternites II-VII with accessory bristles ... *angusticeps* Uzel
Abdominal sternites without accessory bristles ... 22

22. Antennal segment III swollen abruptly ventrally and dorsally above pedicel. Body blackish-brown ... *dilatatus* Uzel
Antennal segment III expanding gradually above pedicel. Body brown. Pronotal posteroangular bristles, inner 50, outer 60 long ... *funebris* Bagnall

23. Macropterous ... 24
Hemimacropterous or micropterous ... 39

24. First vein of forewing normally bears 3 bristles on distal half ... 25
First vein of forewing normally bears 4 bristles on distal half ... 35
First vein of forewing normally bears 5-12 bristles on distal half 38

25. Sides of head converging strongly to base. (Very young adults) ... *physapus* L.
Sides of head not converging strongly to base; cheeks more or less curved outwards ... 26

26. Abdominal sternites III-VII bearing accessory bristles ... 27
Abdominal sternites without accessory bristles ... 28

27. Sides of head converging to base. (Very young adults) ... *physapus* L.
Sides of head not converging to base; pronotal long bristles 43-57. (Very young adults) ... *praetermissus* Priesner

28. Body bristles dark brown, seen against white paper. Abdominal tergite VIII with comb across middle of posterior margin ... 30
Body bristles hyaline. Comb represented by few teeth at sides ... 29

29. Body yellow to orange, shaded brown; antennal segments I, III hyaline, II brown, IV, V in distal half and VI-VII brown. 1 mm. ... *albopilosus* Uzel

30. Posteroangular bristles not longer than one-third length of pronotum ... 31
Posteroangular bristles at least half length of pronotum ... 32

31. Antennal segment I pale yellow, II-VII brown; body pale brownish-yellow; posteroangular pronotal bristles 17-26 long. 0.9-1.0 mm. ... *frankeniae* Bagnall
Antennal segment I hyaline, II, III greyish-yellow, others greyish-brown with bases IV, V paler; body yellow to greyish-white: inner posteroangular bristle one-third length of pronotum. 0.7 mm. ... *debilis* Bagnall

32. Body lemon to orange-yellow, without dark pigment in sclerites 33
Body yellow. Brown or grey pigment more or less present in sclerites of head, thorax and abdomen ... 34

33. Antennae yellow, III-V shaded brown at apex, VI-VII brown; posteroangular bristles about 84 long; forewings pale yellow. 1.2-1.6 mm. ... *flavus* Schrank

Antennae brown, III yellow in basal half; posteroangular bristles 55-76 long; forewings yellowish-brown. 1.2-1.4 mm. ... *alni* Uzel

34. Antennae brown, I yellow, III and base IV yellowish; posteroangular bristles 65-75 long; forewing pale yellow. 1.1-1.4 mm. ... *nigropilosus* Uzel

Antennae brown, I yellow, III-V yellow in basal halves; posteroangular bristles 60-80; forewings pale yellow. 1.0-1.3 mm. ...... *urticae* Fabr.

35. Abdominal sternites III-VII, each with 1-5 accessory bristles ... 36

Abdominal sternites without accessory bristles 37

36. Body yellow with brown shades in sclerites of head, thorax and abdomen; legs yellow shaded brown; wings concolorous brownish-yellow; with dark brown bristles; ocellar crescents greyish-yellow; antennal segments I pale yellow, the others brown with III and the bases of IV, V usually paler; pronotal posteroangular bristles, inner 59, outer 43; longest bristles on tergite IX 95-108. 1.1-1.3 mm. .... *origani* Priesner

37. Body yellow, with brown pigment more or less developed in sclerites of head, thorax and abdomen and often seen as bars across the abdomen; legs yellow shaded brown; ocellar crescents greyish yellow; wings concolorous pale brownish-yellow; antennal segments I hyaline, others yellowish-brown with the bases of III-V paler; pronotal posteroangular bristles 33-45 long; comb on VIII complete dorsally. 1.0-1.3 mm. ...... *tabaci* Lindeman (*dorsalis* Bagnall)

38. Body very pale yellow, faintly shaded with grey in sclerites; forewing yellow; antennae greyish-brown, I, basal half or third of II-VI yellow; bristles slender, brownish yellow, posteroangular inner 50, outer 40. 1 mm. .... *euphorbiicola* Bagnall

39. Bristles and antennae brown except for yellow I, III and base IV ... *nigropilosus* Uzel

T. physapus‡ L. (figs. 1, 2). ♀♀ 4-9, ♂♂, larvae 5-9. Common. Larval hosts, *Taraxacum*, *Hypochoeris*, and a few other Compositae. In habits and morphology resembles *Taeniothrips frici* Uzel. I have found it in 18 counties in England, 9 in Scotland up to Sutherland, 2 in N. Ireland and have records from 2 in Wales. London: City, Hyde Park and 13 other districts.

T. praetermissus‡ Priesner. ♀♀, ♂♂ 7-8. Often numerous on *Senecio*, *Achillea*, *Matricaria*, *Pyrethrum*. Beds, Cambs, Essex, Herts, Middlesex, Notts. London: City, Hyde Park and 5 other districts.

T. validus‡ Uzel. ♀♀ 3-10, ♂♂ 4-10, larvae 6-11. Common. Larval hosts include *Hypochoeris*, *Taraxacum*, *Hieracium*, *Crepis*. British distribution like that of *physapus*. London: St James's Park, S. Kensington, and 8 other districts.

T. calcaratus‡ Uzel. ♀♀ 4-7, ♂ (undescribed) 5, larvae 6-7. Adults often numerous on or near larval host *Tilia vulgaris*. Bagnall told me that he had found males in England and I found one in Kincardineshire. Middlesex, Westmorland, Aberdeen, Banff, Inverness, Kincardine, Moray, Perth, Ross. London: Millhill.

T. fuscipennis‡ Haliday. (Fig. 5). Rose Thrips. ♀♀ 1-12, ♂♂ 6-10, larvae 5-9. Larval hosts include *Althea*, *Asparagus*, *Chenopodium*, *Fragaria*, *Fraxinus*, *Mentha*, *Prunus*, *Rosa*, *Rubus*, *Ulmus*. I have found it in 20 counties in England, 10 in Scotland, Co. Down, and have records from Wales. Abundant in S. England and occurring in Ross, but apparently limited by climatic factors north of Kincardine. London: Chelsea, Hyde Park and 26 other districts. I have found adults on about 200 spp. flowering plants. In southern England *fuscipennis*, *major* and *flavus* are the chief "flower thrips," the adults occurring in flowers of most spp. plants; in N.E. Scotland their place is taken by *Taeniothrips atratus* and *T. vulgatissimus*.

T. major‡ Uzel. Rubus Thrips. ♀♀ 3-9, ♂♂ 7-9, larvae 5-9. Larval hosts include *Crataegus*, *Epilobium*, *Prunus*, *Rubus*. I have found it, often numerous, in 16 counties in the southern half of England, 2 in N. Ireland, not in Scotland. London: City and 23 other districts.

T. difficilis Priesner. Bagnall recorded "the species" and its larvae from Lancs., Durham and Ayrshire on *Salix repens*.

T. junipericola n.n. for *juniperina* Bagnall nec Linn. Bagnall was doubtful about the synonymy, which he did not study in detail. His species is certainly not that of Linnaeus. I hope to publish on the synonymy and life-history in the near future. ♀♀ 1-11, ♂♂ 7-8, larvae 5-8, pupation on host, *Juniperus communis*, on which the species is often numerous. Kincardine to Sutherland. Likely to occur in S. England where the host grows commonly.

T. sambuci‡ Heeger. ♀♀ 8-9, ♂♂ 8, larvae 8. Larval hosts *Sambucus nigra*, *S. racemosa*. Middlesex, Sussex, Aberdeen. Speyer found ♀♀ under bark of hybrid elder in winter, locality not stated, probably Cheshunt. London: Kensington (*T. nigra* Williams) Females are easily recognised in the field from *fuscipennis* and *major*, which may occur on elder flowers, by the more contrasting black and white of the wings.

T. viminalis Uzel. Bagnall recorded "several specimens" from Durham on *Salix*.

T. menyanthidis Bagnall. Described from females on *Menyanthes trifoliata* from Westmorland and Durham.

T. euphorbiae Knechtel. Bagnall described a female (*T. crassicornis* sp. n.) from Devon on *Euphorbia* sp. and recorded *T. euphorbiae* Knechtel specimens (presumably females) from Hants. and Somerset on *E. amygdaloides* in April and June.

T. fulvipes‡ Bagnall. ♀♀ 5-8, ♂♂ 7-8, larvae 8. Fairly common on larval host, *Mercurialis perennis*. Kent, Middlesex, Northumberland, Oxford, Surrey, Sussex, Warwick, Aberdeen, Haddington, Kincardine. London: Chelsea, also London Area (Bagnall).

T. paludosus Bagnall is queried, presumably by Bagnall, in the list of Kloet and Hincks (1943) as a synonym of *fulvipes* Bagnall. The species is inadequately described but as the description does not apply to either sex of *fulvipes* or *discolor* in my large collections of these species, I retain *paludosus* as a valid species. Bagnall found ♀♀, 1 ♂

on sedge and a Cruciferous plant in a bog in Oxon, and ♀♀ on *Erica tetralix* in a bog in Warwick during September 1913.

T. biformis‡ Bagnall. ♀♀, ♂♂ 8. *Phalaris arundinacea*, which is probably the larval host. Probably common in southern England. Oxford. London: Sunnymeads, Middlesex. The females are morphologically fairly close to the N. and S. American *Plesiothrips*, which probably breed on Gramineae. I consider var. *adustus* Bagn. and var. *melanurus* Bagn. merely colour phases of certain individuals.

T. dilatatus Uzel. ♀♀ 6-9, ♂♂ 6-10, larvae 7-9. Common on or near larval hosts, *Euphrasia*, *Rhinanthus*. Northumberland, Surrey, Sussex, Aberdeen, Banff, Inverness, Kincardine, Moray.

T. funebris Bagnall. ♀♀ 5-9. Macropterous ♀♀ almost certainly occur. Larval hosts unknown, probably some species of plant in the low herbage of salt marshes. Bagnall described a female from Hants.; I named a female from Cheshire for H. Britten and found 9 ♀♀ (micropterous) in Norfolk.

T. klapaleki Uzel. Bagnall recorded a female from Northumberland. Found on *Orchis* spp. in Europe.

T. paluster Reuter. Bagnall recorded ♀♀ from *Pedicularis palustris* near Cowley, Oxon in August-September. But this is perhaps not the species redescribed by Priesner (1930) from Reuter's original female.

T. discolor Haliday. ♀♀ 1-12, ♂♂ 7-9, larvae 8-9. Larval host. *Ranunculus repens* leaves, not *Holcus lanatus* as I stated in 1943. Haliday found both sexes near Dublin. I have found the species, often commonly, in Kent, Middlesex, Norfolk, Aberdeen, Inverness, Kincardine, Moray, Co. Down.

T. hawaiiensis Morgan. Bagnall recorded a female (*albipes*) from Durham.

T. tabaci‡ Lindeman. Onion Thrips. ♀♀ 1-12, ♂♂ 6-9, larvae 5-12. Common. Chief larval hosts are certain Compositae, *Achillea*, *Senecio*, but the insect breeds on many species of flowering plants in many different families. I have records of it from Sussex, Caithness, Wales and many intermediate counties, Co. Down, Antrim. London: City, Hyde Park and 22 other districts. This cosmopolitan species is of considerable economic importance in many parts of the world, and it was described in 1888 from Bessarabia, but I believe that the first reference (syn. n.) to it is by Ruricola (Curtis) 1846, *The Gardeners' Chronicle*, p. 564, when he called it the Potato Thrips, *Thrips minutissima*, and described the female, larva and pupa and figured the larva, found on potato plants in Oxfordshire. I cannot separate *dorsalis* Bagnall, either from the description or from paratype females, from banded females of *tabaci*.

T. angusticeps‡ Uzel. Cabbage Thrips. ♀♀, ♂♂ 4-7, larvae 5-7. Larval hosts, *Brassica*, *Taraxacum*, *Linum* and probably other plants. Common to abundant. I have found it in 8 counties in southern England and in Aberdeen (apparently introduced), and I have it recorded from 2 counties in Wales. London: Warlingham, Bedford Park (in flowers from shop).

T. minutissimus L. ♀♀ 4-7, ♂♂, larvae 5-7. Larval hosts, *Quercus robur*, *Crataegus*. Widely distributed and common in southern England, found in Wales and 7 counties including Sutherland in Scotland.

T. albopilosus Uzel. Bagnall recorded 2 ♀♀, 1 ♂ from *Juniperus communis* in Inverness-shire.

T. frankeniae Bagnall. Bagnall recorded 1 ♀ from *Frankenia* in Norfolk.

T. debilis Bagnall. Bagnall described a female on *Erica* sp. in the Isle of Wight, and later described the male and recorded females from Italy.

T. flavus‡ Schrank. Honeysuckle Thrips. ♀♀ 1-12, ♂♂ 6-10, larvae 5-9. Larval hosts include *Lonicera periclymenum*, *Ulex*, *Malva*, *Senecio*, *Geum*, *Verbascum*. Common to abundant. More numerous in S. than N. Britain. Sussex, Caithness and many intermediate counties, Wales, N. Ireland. London: Hyde Park and 15 other districts. cf. *Taeniothrips flavus* Bagnall.

T. alni Uzel. Bagnall recorded ♀♀ on *Alnus glutinosa* from Westcott, Surrey, 5/1926.

T. nigropilosus‡ Uzel. Chrysanthemum Thrips. ♀♀ 1-12, larvae 5-11. Larval hosts *Plantago lanceolata*, *P. maritima*, also lettuce, Chrysanthemum and some other plants. Common. Essex, Middlesex, Norfolk, Notts, Surrey, Suffolk, Aberdeen, Banff, Kincardine, Moray, Nairn. London: Purfleet, Reigate.

T. urticae‡ Fabr. ♀♀ 5-8, larvae 5. Larval host *Urtica dioica*. Probably fairly common in southern England. Devon, Herts, Kent, Norfolk, Surrey, Sussex. London: Shoreham, Wrotham.

T. origani‡ Priesner. ♀♀ 7-9. *Origanum vulgare*. Probably fairly common on host. Kent, Surrey. London: Woldingham, Purley, Coulsdon Common, Gethling.

T. euphorbiicola Bagnall. ♀♀ 4-9, ♂♂ (undescribed) 9, larvae (undescribed) 9. Larval host, *Euphorbia amygdaloides*. Distribution probably determined by the distribution of this plant. Hants, Somerset, Surrey. London: ? Surrey Hills (Bagnall). I found both sexes and larvae on *E. amygdaloides* at Virginia Water, Surrey.

Stenothrips Uzel.

S. graminum‡ Uzel. Body dark brown; head about as long as wide; legs brown, tibiae and tarsi yellowish; wings brown. 1.0-1.4 mm. ♀♀ 5-10, ♂♂ 5-7, larvae 7. Larval hosts probably include oats, barley, certain grasses, *Lotus*, *Trifolium*. Common to abundant in the southern half of England, where I have found it in 14 counties, and I have a record from Wales. London: E. Sheen, Millhill.

Baliothrips Uzel.

Larger; pronotum 175 (250), mesothorax width 320, abdomen 350, tibia I 140 (52), II 135 (48), III 184 (45); antennal segment III 52 (22), IV 48 (23), VI 54 (24) .... *dispar* (Haliday)

Smaller; pronotum 138 (165), mesothorax width 250, abdomen 258, tibia I 125 (45), II 100 (42), III 152 (38); antennal segment III 43 (20), IV 43 (20), VI 37 (22) .... *exilis* Bagnall

B. dispar‡ (Haliday). Body dark brown; antennae brown; III yellowish, IV darker yellowish-brown; apices of tibiae and tarsi yellow; wings dark brown with pale area near base and another before apex. 1.2-1.6 mm. Macro-, hemimacro- or micro-pterous females, micropterous males. ♀♀ 1-12, ♂♂ 6-12, larvae 6-10. Larval hosts include *Glyceria* spp., *Holcus lanatus*, *Digraphis*, *Arundo*, *Agrostis stolonifera*. Most abundant in marshy places but able to become numerous in dry places if the grass is not cut or grazed in summer and autumn. Sussex, Moray and many intermediate counties, Belfast. London: gardens of British Museum (Natural History), Stoke Newington and 10 other localities.

B. exilis Bagnall. Bagnall described two macropterous adults from Cheshire on *Holcus lanatus*. He did not describe the colouration, anatomical details or sex. From him I quote the only characters that may serve to separate *exilis* from *dispar*, which varies in size of body and in degree of wing-development in females.

Platythrips Uzel.

P. tunicatus‡ (Haliday). Head, thorax, abdominal segments IX, X orange to brownish-yellow; abdominal segments II-VIII very dark blackish brown, I may be paler; legs yellowish; wings brownish-yellow, ♀♀ macropterous or apterous, males micropterous or apterous; antennae brown; male yellow. 1.3-1.5 mm. ♀♀ 1-12, ♂♂ 5-12, larvae 5-10. Larval hosts *Galium saxatile*, *verum*, *palustre*, *Stellaria uliginosa*. Common. Bucks., Essex, Notts., Surrey, Sussex, Aberdeen, Banff, Inverness, Moray, Nairn, Ross, Sutherland. London: Borough Heath, Epping Forest, Richmond Park.

Bolacothrips Uzel.

B. jordani Uzel. Bright yellow. ♀♀ macropterous or apterous, ♂♂ apterous. 0.9-1.2 mm. Cf. males of *Platythrips*. Williams found 1 ♂ in Sedge stack in Cambridge.

Tmetothrips Amyot et Serville.

T. subapterous (Haliday). Dark concolorous brown body; antennae brown, III-V paler; legs brown, tibiae and tarsi usually yellow; wings concolorous yellowish-brown, slightly darker at base and apex. ♀♀ macropterous or micropterous, ♂♂ micropterous. 1.2-1.5 mm. ♀♀, ♂♂, larvae 7. Larval hosts, *Galium palustre*, *Stellaria* sp. Bucks., Durham.

Frankliniella Karny.

1. Females blackish-brown, 1.5-2 mm. ...... cf. *Kakothrips* Williams
   Females yellowish or reddish-brown, at lesat in thorax, 1.2-1.8 mm. 2
   Frankliniella Karny cf. *Parafrankliniella* Priesner

2. Head about as long as pronotum, as broad as long or very little broader than long, projecting roundly in front of eyes; cheeks parallel; antennae long and slender, III more than 3 times as long as broad, VII about as long as VIII ... *tenuicornis* (Uzel)

   Head shorter than pronotum, clearly broader than long, cut off almost straight in front of eyes; cheeks usually converging from eyes to base of head; antennae with more rounded segments; III at most 2.6 times as long as broad; VII about as long as VIII 3

3. Cheeks converging to base of head; longest postocular hair weak, 20-28 long .... *intonsa* (Trybom)

   Cheeks not converging to base of head; longest postocular hair robust, 34 long .... *anglicana* Bagnall

F. intonsa‡ (Trybom). Flower Thrips. ♀♀ 1-12, ♂♂ 6-10, larvae 7-10. The chief larval host is *Erica tetralix* in marshy ground, but the insect breeds on *Ononis*, *Rosa* and many spp. wild and cultivated plants on drier habitats. Common in England. Found in Aberdeen, Kincardine, Nairn. London: City, Hyde Park and 17 other districts. I found var. *maritima* Priesner ♀♀ on *Armeria maritima* and *Cochlearia anglica* on the Norfolk coast and as they differed from *intonsa* only in the length of some antennal segments, and as the larvae with them were identical with those of *intonsa*, I consider *maritima* a form but not a variety of *intonsa*.

F. anglicana Bagnall. Bagnall found and described 1 female from a Pine tree in Berkshire.

F. tenuicornis‡ (Uzel). ♀♀ 5-11, ♂♂ 6-9, larvae 7-8. Seems to prefer barley to wheat, oats or rye for larval host. Probably breeds on certain spp. grasses. Often numerous locally. I have found it in 6 counties in southern England and in Kincardine, Aberdeen, Moray, Nairn. London: Sunnymeads.

Parafrankliniella Priesner.

P. verbasci‡ Priesner. Dark brown or yellowish brown; antennae brown, III yellow; forewings hyaline at base, dark in middle, paler at apex; numerous accessory bristles on abdominal sternites III-VII. 1.4-1.7 mm. ♀♀, ♂♂ 7. Probably common in southern half of England on larval hosts, *Verbascum* spp. London: Woldingham, Warlingham, Purley, Kew.

Kakothrips Williams.

K. robustus‡ (Uzel) (*Frankliniella pisivora* Westwood). Pea Thrips. Body very dark brown; antennae brown with at least III yellow; fore tibia and all tarsi yellowish; forewings dark brown, hyaline at base. 1.5-2 mm. ♀♀ 5-7, ♂♂ 5-6, larvae 6-8. Larval hosts include *Pisum*, *Lathyrus*, *Vicia*, *Galega*. Widely distributed, often numerous and harmful to peas in southern England. Found in Yorkshire. No records for Scotland. London: Goodmayes, Stoke Newington.

Scolothrips Hinds.

Length female antenna about 190, II 27, VI 35 ... . *sexmaculatus* (Pergande)
Length female antenna about 210, II 27, VI 45 ..... *longicornis* Priesner

S. sexmaculatus (Pergande). Is not British as it apparently did not establish itself in 1938 when E. R. Speyer introduced it from California to a hothouse in England for the control of redspider.

S. longicornis Priesner. Pale yellow, macropterous. 1.2 mm. I found a female on herbage, Flitcham, Norfolk, 27/5/1944, and this is the first record of the species from Britain, though Bagnall lists it in Kloet and Hincks (1943) and I believe that he found it in the south of England. The species is likely to occur on plants frequented by redspider, on which it probably is predacious.

Euchaetothrips Bagnall.

E. kroli‡ (Schille). Dark brown body; antennae brown, III yellow, IV yellowish; legs brown, fore tibiae, apices of other tibiae and all tarsi yellowish; forewings dark brown with a lighter cross area near the base and another before the apex; ♀♀, ♂♂ macropterous. 1.4-1.8 mm. All instars 5-9, often numerous on larval host *Glyceria maxima* (*aquatica*). Cambs, Essex, Hants, Hunts, Lancs., Middlesex, Norfolk, Northumberland, Salop, Surrey. London: Buckhurst Hill, Epping Forest, Hampstead Heath, Kew, Staines, Weybridge. Cf. *Baliothrips*.

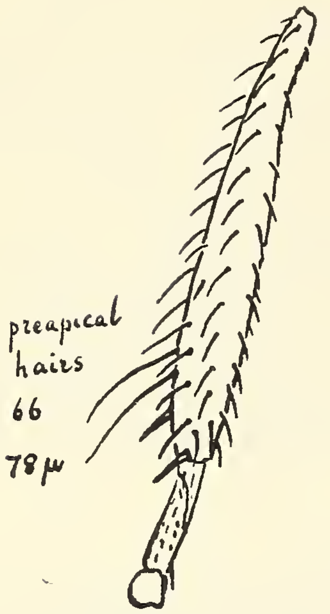

Fig. 13.

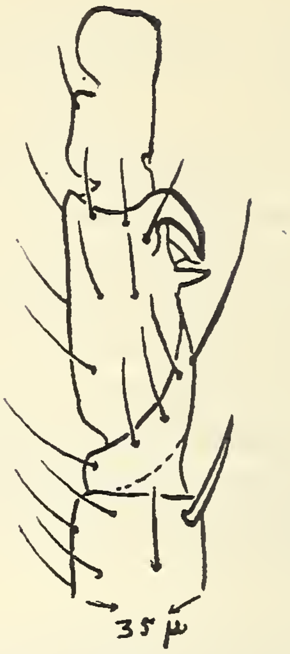

Fig. 14.

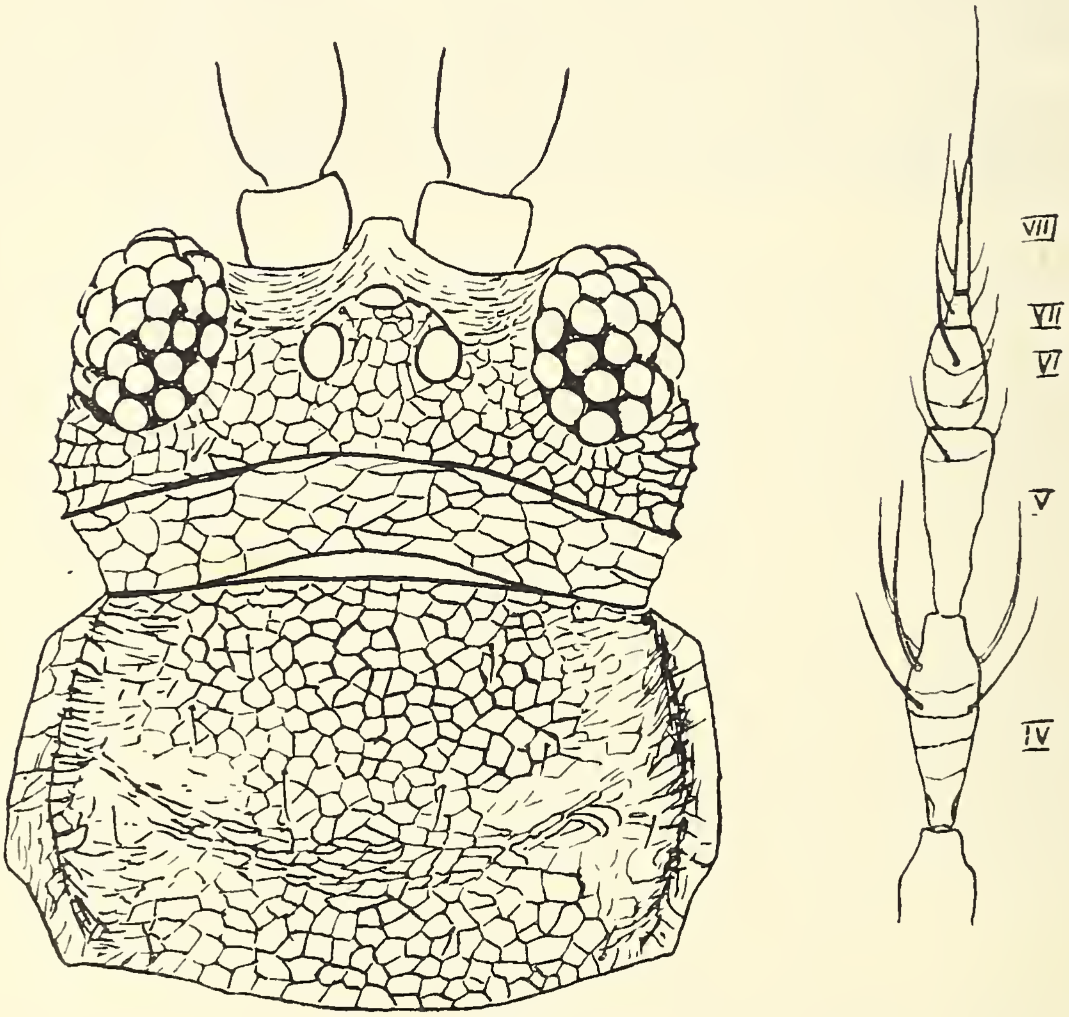

Fig. 16.

Fig. 13. *MELANTHRIPS GRACILICORNIS* Maltbaek. Side view of hind tibia of female.

Fig. 14. *AEOLOTHRIPS PROPINQUUS* Bagnall. Side view of fore leg tarsus of female, showing triangular process between spine and hook on 2nd segment.

Fig. 16. *HELIONOTHRIPS ERRANS* (Williams). Dorsal view of head pronotum and antennal segments IV-VIII of female.

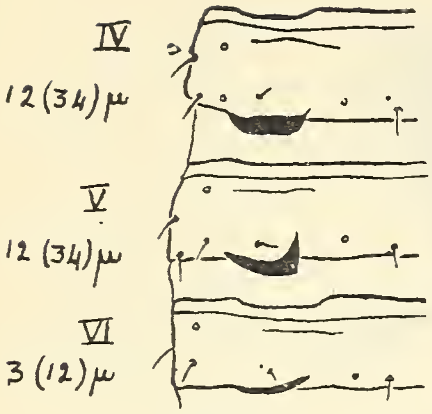

Fig. 15

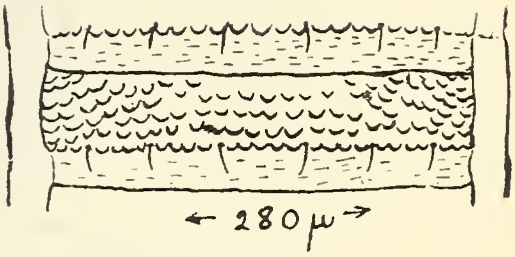

Fig 18.

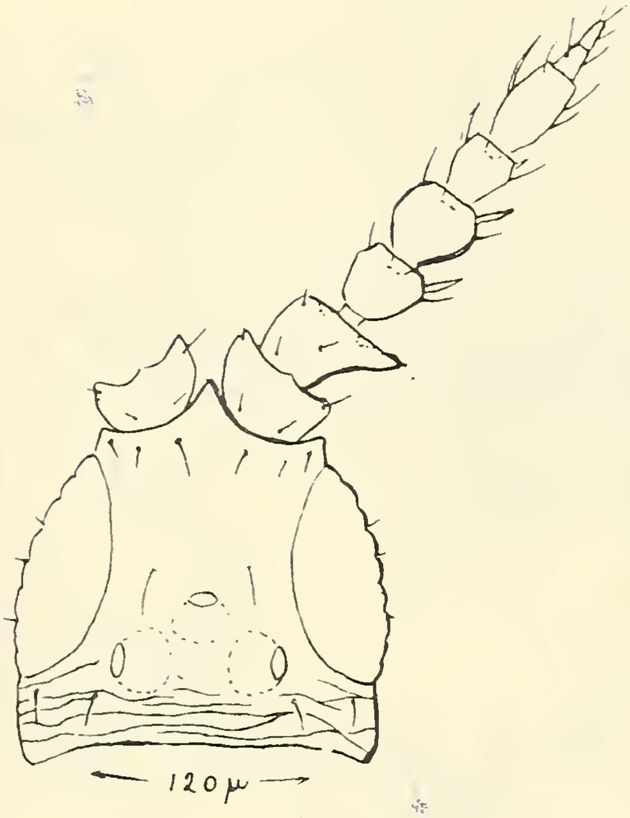

Fig. 17.

Fig. 15. *AEOLOTHRIPS TENUICORNIS* Bagnall. Left side of abdominal tergites IV-VI of male.

Fig. 17. *CHIROTHRIPS MANICATUS* Haliday. Dorsal view of head and right antenna of female.

Fig. 18. *CHIROTHRIPS MOLESTUS* Priesner. Abdominal sternite IV. of female.

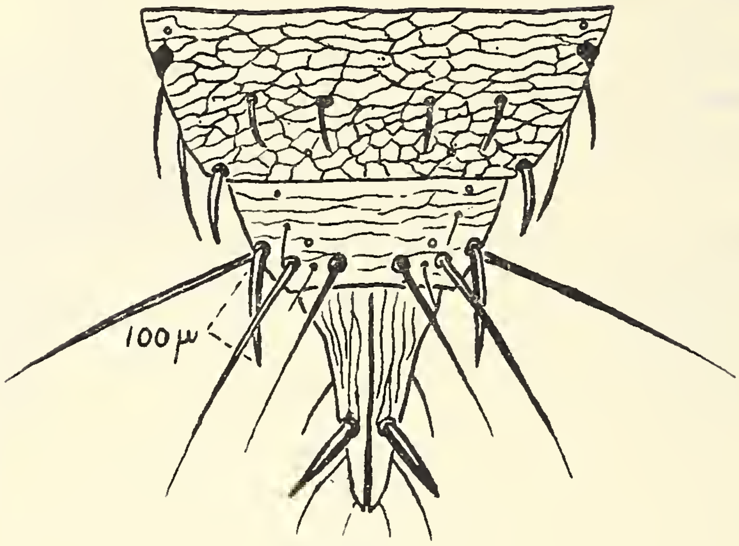

Fig. 19.

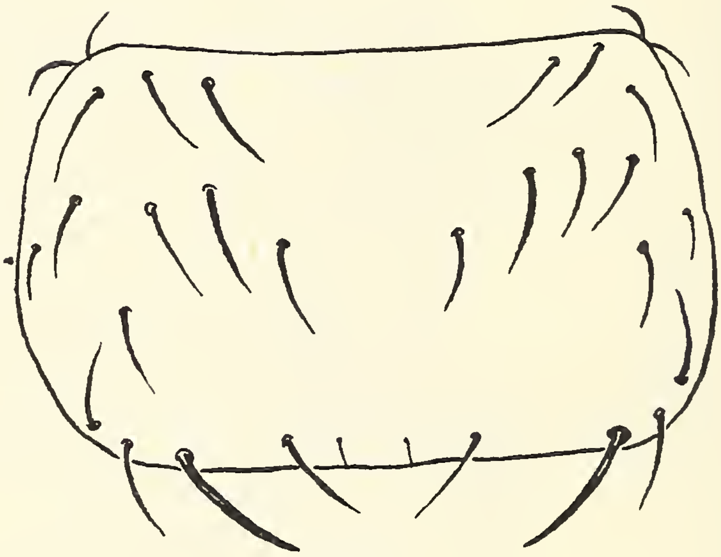

Fig. 20.

Fig. 19. *LIMOTHRIPS DENTICORNIS* Haliday. Dorsal view abdominal segments VIII-X of female.

Fig. 20. *SERICOTHRIPS STAPHYLINUS* Haliday. Pronotum of female macro- or micropterous. Striae not shown.

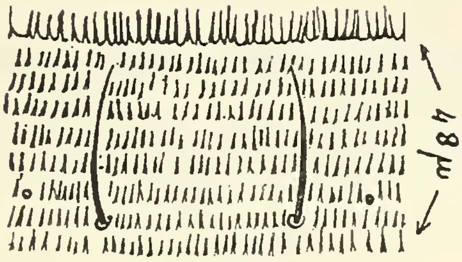

Fig. 21.

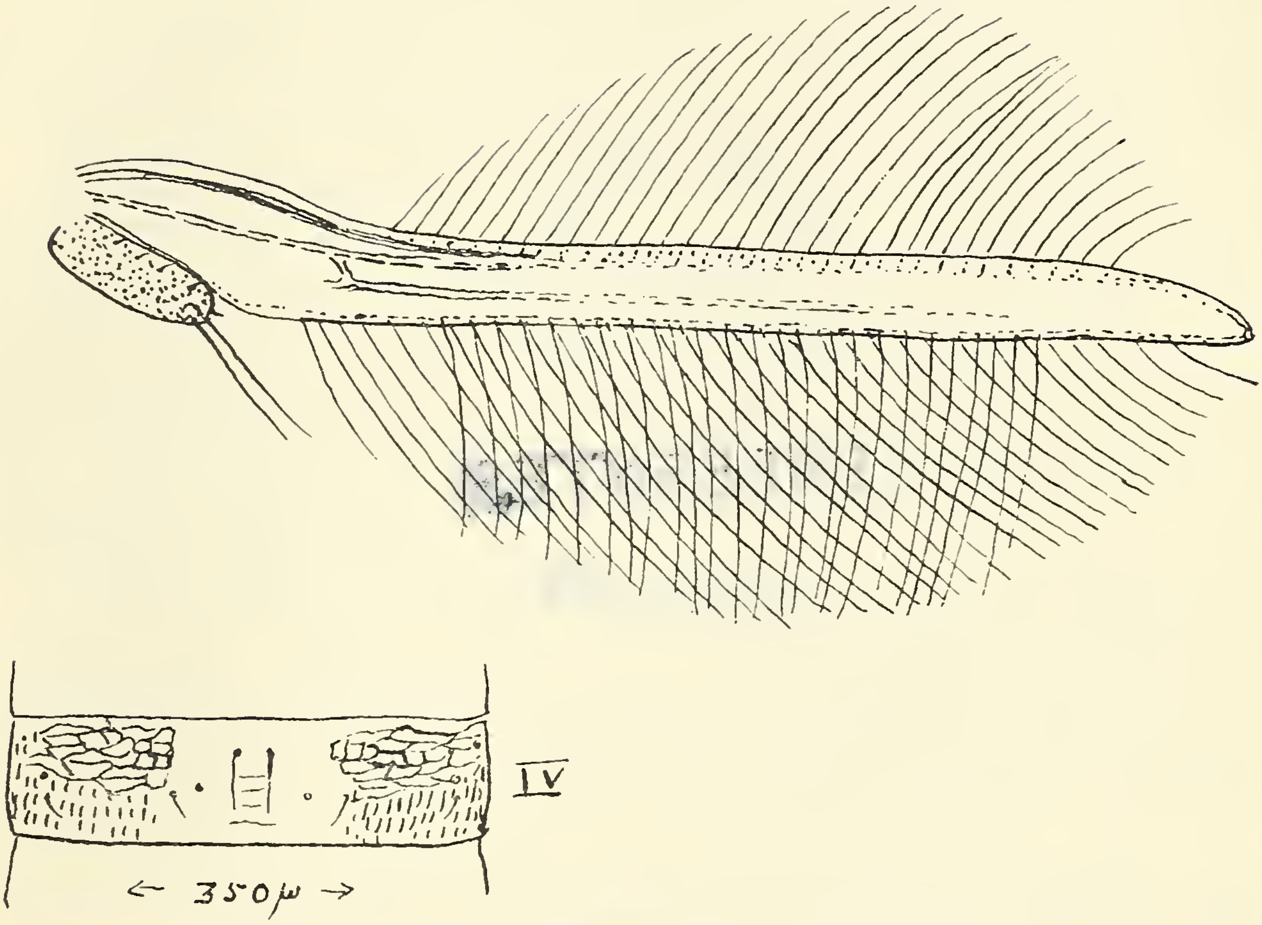

Fig. 22.

Fig. 21. *SERICOTHRIPS STAPHYLINUS* Haliday. Portion of abdominal tergite IV showing microtrichia.

Fig. 22. *DENDROTHRIPS DEGEERI* Uzel. Fore wing and abdominal tergite IV of female.

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Supplement to The London Naturalist.

Thysanoptera of the London Area.

By GUY D. MORISON, North of Scotland College of Agriculture,
Marischal College, Aberdeen.

Part III.

Key to British Genera and Species of Thysanoptera (contd.).

Sub-order *TUBULIFERA*.

Super-family PHLÆOTHRIPOIDEA. Family PHLÆOTHRIPIDAE.

The classification of the British Tubulifera is more complicated than that of the Terebrantia because of greater anatomical variation in each of several species. Karny, Bagnall, Hood and Priesner have described or recognised in the Phlæothripidae various sub-groups which I shall not adopt in this paper as many of them are not clearly separable.

Following the international rules on zoological nomenclature that a genus should be founded on a type species, I have defined the genera in their key. The genus is described in detail before the key to species because I believe that many of the British genera need greater definition than they have received previously. The cuticular colouration and the measurements of type species (when this is British) are described under the individual species. In genera like *Phlœothrips* and *Haplothrips* which include many species, the degree of variation that I allow to the genus is described in the key to species.

I consider that in the Thysanoptera the genus should be instituted on adults of both sexes and that most attention should be paid to the skeleton of the female, the less variable sex, precedence being given to females and macroptera over microptera and aptera. Morphology of immature instars and the bionomics of the species should also be taken into consideration.

Certain genera or sub-genera have been erected on one sex (usually the more variable male) and the other sex falls into another genus (*Megalothrips* Uzel comes partly under this heading) or the genus (*Zygothrips* Uzel) or sub-genus (*Xylaplothrips* Priesner) has been instituted on comparatively minor or variable characters. In such cases it seems most satisfactory to recognise the genus which has priority, and, if the other name is not dropped as a synonym, to retain it as a group-name subordinate to the genus. Priesner has done this for the divisions of *Haplothrips*.

The chief variation within the species lies in adults of one or both sexes varying in colouration, fore-leg development and wing development. Young adults are usually paler than the old. Besides the colour differences between youth and age in *Phlœothrips pedicularius* Hal. and other species, there are different colour variations with many intergrades in both sexes. The forelegs vary in size and structure partly depending on the sex in certain species. In these species most of the males have the fore femora much swollen and the tibiae and tarsi may bear claws, and most of the females have the fore femora scarcely swollen and the claws on tibiae and tarsi reduced or absent, but specimens of either sex may show gradation of leg development from the extreme of one sex to that of the other. The size of the claws on femur, tibia and tarsus, compared with other parts of the leg, may vary considerably within the species. Correlated with the degree of development of the forelegs is the size of the prothorax. The pterothorax is usually reduced when the wings are micropterous or undeveloped. The long bristles of head, thorax and abdomen may vary in length compared with other parts of the body in correlation with the degree of wing development; also there may be a difference in comparative lengths corresponding with the sex, and in some species certain bristles may be expanded at the tip in only one sex. The numbers of accessory cilia (duplicated hairs) on the forewings is very variable in some species, nevertheless it is of some help in specific classification. The cilia of both wings are usually smooth-sided, but in some species they are more or less setulose (*Haplothrips setiger* Pr. (Fig. 28), *Megathrips lativentris* Heeger, *M. bonannii* Uzel). The number of sense cones on antennal segments III and IV is of some help in specific determination and Hood (1908, 1931) has published a formula for describing the arrangement of the cones: The number of the antennal segment is followed first by the number of sense cones on its inner surface and then by the number on its outer surface, rudimentary cones being expressed by an exponent preceded by a plus sign. Thus V, 1—1+1 means that on the fifth antennal segment there is one fully developed sense cone on either side, with an additional rudimentary cone on the outer surface. Like Priesner in most of his keys to species I shall refer only to the longer cones.

The keys for genera and species are compiled for insects mounted in a resinous medium as described early in this paper, but they may be applied to specimens in other types of mountant or to living insects examined by reflected light in air, but dry insects, living or dead, will show more contrasting colours than those described. The specimen should be examined by transmitted light and also by reflected light, using first a white and then a black paper background and objectives ranging from 1″ to $\frac{1}{6}$″ or higher and suitable eye-pieces.

Measurements are in microns, 0.001 mm. = 1μ. Length of insects is written in mm. compared with width across pterothorax in brackets. Head length is measured from fore margin of eyes to base on dorsal surface. Eye length is the maximum in a straight dorsal line parallel to the long axis of the body. Mouthcone length is the longest in a straight line from base to apex parallel to the long axis of the head on the ventral surface (cf. figs. 23, 33). Tube length from base to apex along mid dorsal line, width at widest and narrowest regions, and the length is compared with the respective widths in comparative figures, e.g. 10 (2:1).

Key to Genera of British Phlæothripidae.

1. Antennae 8-segmented. Circular area on antennal segment II placed dorsally between middle and apex (figs. 23, 29). Wings in one or both sexes macropterous, reduced or undeveloped ... 2
Antennae 7-segmented .... Not British
2. Body large, usually longer than 3.5 mm. in both sexes. Abdominal segment VI of male on either side with a tubluar process ... 3
Body smaller, usually shorter than 3.5 mm. Abdominal segment VI of male lacks tubular process on either side 3
3. Tube 3-6 times as long as abdominal segment IX 4
Tube shorter than 3 times the length of abdominal segment IX ... 5
4. Head nearly twice as long as wide, somewhat extended in front of eyes; mouthcone rounded at apex as seen in dorsal or ventral view; antennae about twice length of head; fore femora not greatly expanded; fore tarsus without tooth (fig. 32) ....
Megathrips T.T.
Characters not combined as above 5
5. Both sexes macropterous (dealated insects usually recognisable from the presence of sigmoid bristles on abdominal tergites II-VII and well developed ocelli; the size of the pterothorax is larger and the body bristles often longer compared with other parts of the body than in apterous or micropterous specimens) ... 6
Both sexes wings reduced or not developed 17
6. Cheeks with conspicuous warts, each bearing a bristle (fig. 29) or with the integument forming a small tubercle around the base of every or of most bristles (fig. 31 A) 7
Cheeks without bristle-bearing warts or tubercles 13
7. Mouthcone pointed at apex (fig. 29) 8
Mouthcone broadly rounded at apex (fig. 23), often not reaching the hind margin of the prosternum, in some species narrow and conical, but then abbreviated at the apex 13
8. White fleck on fore angles of each of abdominal segments II-VIII viewed against dark paper 9
No white fleck on body 9
9. In both sexes fore femur broad and with a tooth near the apex; fore tibia without tooth near base; fore tarsus with strong tooth 10
cf. *Acanthothrips* Uzel
In both sexes fore femur broad; in ♀ fore femur and tibia without teeth, in ♂ fore femur with two teeth near apex and fore tibia with one tooth near base; fore tarsus bears strong tooth 10
cf. *Hoplandrothrips* Hood
In both sexes fore femur broad, unarmed; fore tibia unarmed; fore tarsus with strong tooth 10
cf. *Euphlœothrips* n.n.
10. Antennal segment III with 3 and IV with 3 long sense cones 11
Antennal segment III with 3 and IV with 4 long sense cones 11
11. Bristles on head, prothorax and abdomen usually of moderate length with tips expanded (figs. 28 Hoplo, 29) 12

Bristles usually long, all rather abruptly pointed (fig. 23) or some pointed and others expanded at tips ...... cf. *Phlœothrips* Hal.

12. Either cheek bearing numerous prominent warts, each with a short bristle directed forwards; these bristles small, about equal in size; between warts lie small cornicles more conspicuous in females .... *Acanthothrips* Uzel

Either cheek bearing 5-8 or 12 prominent warts, each with a short bristle directed forwards; bristles small about equal in size; no cornicles between warts (fig. 29) .... *Euphlœothrips* n.n.

Either cheek bearing 3-6 small tubercles, each carrying a bristle; bristles rather stout, dark; those near base of head longest ...... *Hoplandrothrips* Hood

Either cheek bearing 3-8 small tubercles, each carrying a bristle; bristles rather stout, dark, almost equal in size (fig. 31 A) .... *Hoplandrothrips* Hood

13. Wings constricted in the middle, sole-shaped (fig. 12) having the insertions of the cilia on either side of the forewing closer together near the middle than near the base where the cilia start 14

Wings not or very slightly constricted in the middle, strap-shaped 17

14. Mouthcone broadly rounded at apex (fig. 26) 15

Mouthcone pointed at apex 16

15. Anal bristles only little longer than tube ...... *Haplothrips* A. & S.

Anal bristles at least twice length of tube; antennal segment III symmetrical in dorsal view ... not British *Karnyothrips* Watson

16. Mouthcone pointed at apex; forewing constricted near middle, sole-shaped; long bristles of body expanded and abbreviated at tips (fig. 28); anal bristles only little longer than tube .... *Neoheegeria* Schmutz

17. Mouthcone elongated and sharply pointed at apex (fig. 34) 18

Mouthcone rounded at apex 19

18. Antennae about twice as long as head, segments III-VI long and slender; mouthcone long, pointed; legs long and slender, fore tarsi unarmed; wings macropterous, strap-shaped; tube almost as long as head, nearly three times as long as broad; prothoracic bristles strong, long and dark (fig. 34) .... *Liothrips* Uzel

19. Head extending a little beyond eyes, which project (fig. 33) 22

Head not extending in front of eyes, except for narrow vertex between bases of antennae (cf. fig. 26) 20

20. Eyes curved in towards mouthcone on ventral surface of head (cf. fig. 33) 23

Eyes not curving towards mouthcone on ventral surface of head 21

21. Head longer than broad, usually broadest at base, antennal segment III clearly longer than IV or V 24

Head usually narrowest near base, broadest just behind eyes; when broadest at base it is as long as broad 25
(cf. also *Haplothrips*)

Head broadest across middle, with cheeks gently curved outwards or parallel, with only minute bristles; antennal segment III slightly asymmetrical, with 2 and IV with 4 sense cones; wings reduced (cf. fig. 26 and *Phlœothrips*) 14
Haplothrips morisoni Pr.

22. Antennae twice as long as head; eyes on the ventral surface curving towards mouthcone; postocular bristles directly against eyes; mouthcone rounded at apex; fore femur usually enlarged in male, scarcely so in female; wings present or absent (fig. 33) ... *Bolothrips* Pr.

23. Body small and narrow; eyes on ventral surface curving towards mouthcone; antennae about 1.5 as long as head, segments II-VI almost equal in length; mouthcone broadly rounded; wings present or absent .... *Cephalothrips* Uz.

24. Antennae little less than twice as long as head, III longer than IV or V; mouthcone broadly rounded at apex; fore femur very slightly enlarged in ♀, moderately to greatly enlarged in ♂; fore tarsus without tooth in ♀, but bearing strong tooth in ♂; wings macropterous or reduced .... *Cryptothrips* Uzel

25. Antennae 2-2.4 as long as head, III, IV and V about equal in length; mouthcone broadly rounded at apex; fore femur little enlarged in ♀, usually greatly enlarged in ♂; fore tarsus with small tooth in ♀, large in ♂; wings macropterous or reduced; body bristles long tapering, but abbreviated at tips (fig. 23) .... *Phlœothrips* Hal.

Cryptothrips Uzel.

Head expanded to base or parallel-sided, not extended in front of eyes, 1.1-1.2 longer than broad, 1.3-1.7 as long as pronotum, 1.25-1.4 as long as tube, beset with 7-8 small hairs on each cheek which bears dark cross striae. Eyes not projecting, 0.3-0.25 length of head, separated by 1.2-1.6 width of eye in both sexes, macroptera, microptera. Ocelli placed between eyes, with each lateral ocellus almost touching the eye and further from the other than from the front ocellus. Postocular bristles set not very close to eyes and about in line with inner margin of eyes, in ♀ rounded at tip (fig. 28), 1-1.3 length of eye, in ♂ pointed, 1.5-2 length of eye. Mouthcone broadly rounded, not quite half length of head. Antennae little less than twice as long as head, 8-segmented, III 2.1-2.5 as long as broad, longer than IV or V; III with 2 and IV with 3 sense cones. Prothorax, including fore coxae about twice as wide as length of pronotum; anteroangular, midlateral, posteroangular and posteromarginal bristles well developed, ♀ tips rounded, ♂ pointed; anteroangular ♀ about 0.4, ♂ 0.7-0.9, posteroangular ♀ about 0.7, ♂ 0.7-0.9 length of pronotum. Pterothorax almost twice width of head in both sexes, macro- or micro-ptera. Fore femur slightly enlarged in ♀, moderately to greatly enlarged in ♂. Fore tarsus in ♂ with strong tooth which is absent in ♀. Females macro- or micropterous, ♂♂ micropterous. Wings strap-shaped, hyaline or faintly yellow; forewing bears 11-21 accessory cilia. Abdomen elongated ellipse, widest across segment III;

segment IX of ♂ extended like a scale over the base of the tube on the ventral surface and 3rd dorsal pair of hairs long, tapering, pointed. Longest bristles on IX-X pointed, little shorter than tube. Tube faintly reticulate in ♀, more clearly in ♂, sparsely set with minute, hyaline hairs, ♀ tapering evenly from base to apex, macroptera about 24 (9 : 5), microptera 22 (9 : 5), ♂ broad and sides slightly curved at base where covered below by scale of IX, thence tapering to near apex where sides are parallel and narrowest, about 19 (9 : 4), comparative measurements. Subcuticular pigment yellow.

Type sp. *nigripes* (Reuter) (=*latus* Uzel).

Key to Species.

Legs dark brown	*nigripes* (Reuter)
Legs yellow	*flavipes* (Reuter)

*C. nigripes** (Reuter) with the characters of the genus which I described from both sexes found in Aberdeen and Kincardineshire and 2 ♀♀ (*major* Bagn.) collected by Williams in 1912 at Merton, Surrey. Both sexes dark brown body, legs and antennae, except for antennal segment III which is more or less yellow, but shaded brown at apex, and IV which may be yellowish at base. ♀♀ 2.25-3.3 (0.45-0.55), ♂♂ 1.7-2.25 (0.43-0.48).

Females, ♂♂, larvae 1-12, eggs 6. Food unknown, probably fungus under bark of dead branches of birch, juniper and other trees. Individuals usually scattered, rarely in groups 10-20. Oxford, Surrey, Warwick, Aberdeen, Kincardine, Nairn, London : Merton.

Bagnall described *williamsi* from a ♂ found by Williams at Merton, Surrey, in 1912. I consider it synonymous with *nigripes* (syn. n.). The only character that separates it from my ♂♂ is that the head is 1.3 against my 1.1-1.2 as long as wide, and the head may be subject to more variation in size than I have found.

*C. flavipes** (Reuter). One micropterous ♂ found under the Basidiomycete, *Stereum rugosum* on a stake of hazel (?) at Kew, Surrey, 24.8.46, is perhaps this species, but Reuter's description is not exact and I hesitate to ascribe the name to this specimen without more evidence. The 3rd dorsal hair on abdominal segment IX is a short, stiff bristle.

Cephalothrips Uzel.

Apterous ♀. Body small and narrow. Head 1.3-1.4 longer than wide, about 1.6 length of pronotum and about twice length of tube, with cheeks almost parallel, marked with thin, dark cross striae, and each bearing about 7 minute hairs. Eyes not projecting, about 0.25 length of head, separated by about 1.5 width of an eye, and each curving in towards the mouthcone on the ventral surface of the head. Ocelli not developed. Postocular bristles about 0.3 length of eye, apparently pointed. Mouthcone broadly rounded and about 0.4 dorsal length of head. Antennae about 1.5 as long as head, 8-segmented, segments II-VI about equal in length, III with 1, IV with 2 sense cones; VI with a broad apex closely joined to the wide base of VII which is cylindrical, with its apex covered by the wide, non-constricted base of VIII. Prothorax with fore coxae scarcely wider than head; anteroangular, midlateral bristles apparently pointed, about 0.1 length of pronotum; posteroangular little longer than posteromarginal, hyaline, flattened at tips, about 0.2 length of pronotum. Pterothorax little narrower than prothorax plus fore coxae. Legs short; fore femur scarcely enlarged; fore tarsus with tooth in both sexes. Abdominal tergites lack sigmoid bristles. Abdominal bristles hyaline or pale brownish yellow, short, flattened at tips; longest on IX, about 0.5 on X, about 0.7 length of tube. Tube about 13 (6:3), broadest near base and evenly constricted from basal swelling to apex; bears cross striae near base and about 6 minute hairs. Subcuticular pigment red.

Macropterous apparently similar to micropterous ♀, but possesses ocelli, larger pterothorax, strap-shaped, hyaline wings without accessory cilia, and probably sigmoid bristles on abdominal tergites II-VII.

Apterous ♂ like micropterous ♀ except for difference in sexual characters and larger fore femora.

Type species *monilicornis* Uzel.

*C. monilicornis** (Reuter). Described above. Dark brown body, legs and antennae except bases of antennal segments III-VI, all tarsi and the apices of the tibiae which are pale yellow. Subcuitcular red pigmentation usually conspicuous in body Micropterous ♀♀ 1.4-2.1 (0.22-0.25), ♂♂ smaller.

Adults of both sexes and larvae could probably be found throughout the year, and fairly numerous locally. Macro- and micropterous ♀♀ recorded 8-9, "winter," ♂♂ not definitely recorded from Britain. Seems to breed on grass. Berks, Cambs, Hants, Kent, Surrey. London: Keston.

Phlœothrips Haliday.

(*Hoplothrips* A. & S., *Trichothrips* Uzel, *Dolerothrips* Bagn.)

Like Hood in his later papers I have taken Haliday's first (1836, 1837) spelling of the genus instead of the accurate transliteration from Greek *Phlœothrips* introduced by Burmeister in 1838 and used by Haliday (1852) for the descriptions of genus and species, though he used *Phlœothrips* in the legends for illustrations of some of the species. According to the international rules of zoological nomenclature it seems to me that we should accept *pedicularius* as the type species of the genus, since its description is recognisable, recognised and applied to the first species described in the new genus by Haliday. *Ph. pedicularius* was instituted on adult insects. However, in 1838 Burmeister described *Ph. pedicularia* after Haliday and remarked that as it lacked ocelli and wings, it could be taken for a larva but for the darker colouration and thicker cuticle. In 1843 Amyot and Serville described *Phlœothrips* with *coriacea* Hal. as the first species as they considered the description of *pedicularia* to be that of a larva and therefore invalid. In 1912 Hood wrote that *coriaceus* Hal. must be considered the type of the genus *Phlœothrips*, for it is the only recognisable one known to Haliday which has not been removed or reduced to synonymy.

Phlœothrips Haliday.

Head (fig. 23) not extending in front of eyes except for narrow vertex between antennae; about as long as broad; in ♀♀ little longer than pronotum, in ♂♂ shorter than or as long as pronotum; about as long as tube. Cheeks almost parallel, but curving in rather abruptly to eyes and constricted into a parallel-sided neck for the basal third of their length; transversely striate, and each bearing 7-12 hyaline, short, stiff bristles directed forwards; some of these bristles with a ring of integument projecting slightly around the base. Eyes not projecting, 0.3 length of head in macropterous ♀♀, 0.22 length in micropterous ♀♀, ♂♂, separated by little more than the width of an eye. Ocelli placed between eyes, with the front ocellus closer to the hind than these are to one another. Vestigial lenses often seen in microptera. Postocular bristles set almost length of eye away from hind margin of eye, ♀♀ 1.4-2, ♂♂ 2 length of eye, abbreviated at tips. Mouthcone broadly rounded at apex, with tip of labrum projecting just beyond labium, about equal to or little longer than half head length. Antennae 2-2.4 length of head, with sockets separated by less than 50μ; 8-segmented, segments III-V about equal in length, III with 3, IV with 4 sense cones. Prothorax including fore coxae in ♀♀ nearly twice, in ♂♂ little more than twice width of head; anteroangular bristle about 0.4, midlateral 0.4-0.5, posteroangular 0.6, posteromarginal and fore coxal about 0.5 length of pronotum in macropterous ♀♀, usually little shorter compared with pronotal length in micropterous ♀♀, ♂♂, abbreviated at tips. Pterothorax little broader than prothorax plus fore coxae in macroptera, little narrower in microptera. Legs of moderate length; fore femur scarcely enlarged in ♀♀, greatly enlarged in ♂♂, fore tarsus with small tooth in ♀♀, large in ♂♂. Females macro- or micro-pterous, ♂♂ micropterous. Wings strap-shaped; forewing has 8-10 accessory cilia. Abdomen elongated ellipse tapering to apex and broadest across segment III where it is little broader than across the prothorax plus fore coxae. Abdominal segment IX of ♂ not extended like a scale over the base of the tube on the ventral surface; it has the 3rd pair of dorsal bristles short and stiff. Tube with sides tapering evenly to apex from small swelling at base; ♀♀ macropterous 5 (2:1), micropterous 4 (2:1), ♂♂ 4.2 (2:1). Abdominal bristles long, curved, tapering but abbreviated at tips; longest on IX, 0.75, on X 1 length of tube. Sigmoid bristles on tergites II-VII weak, even in macroptera. Subcuticular pigment crimson.

Type species *pedicularius* Haliday.

The 10 British species form a well defined group with *longisetis* Bagn. the most aberrant member. I have referred to *Phlœothrips* as *Hoplothrips* in the early part of this paper.

Key to Species.

1. Antennal segment VIII distinctly separated from VII (fig. 23) ... 2
   Antennal segment VIII only separated from VII by a thin clear line (fig. 24). Body brown, tibiae and tarsi mostly yellow; long bristles on abdominal segments IX, X longer than tube .... *longisetis* (Bagn.)

2. Females macropterous 3
Females micropterous or apterous 12
Males macro-, micro- or a-pterous 17

3. Head brown, tube yellow, head and tube about equal in length ... 4
Head and tube coloured differently from above 5

4. Subcuticular pigment crimson; claw on fore tarsus conspicuous (fig. 23); longest bristles on IX shorter than tube; antennae yellowish-brown, with bases of III-VI and under surface of I, II paler yellowish .... *pedicularius* Hal.
Subcuticular pigment white; claw on fore tarsus minute; longest bristles on IX as long as or longer than tube; antennal segment I dark brown, II-VIII yellowish-brown and the terminal may be the palest .... *flumenellus* (Hood)

5. Antennal segment I paler than the terminal segments 6
Antennal segment I about the same colour or darker than terminal segments 9

6. Head little broader than long 7
Head about as broad as long 8

7. Body colour greyish yellow, prothorax darker; head greyish yellow; tube as long as head, dark brown, paler at base; antennal segment III bears 2 and IV 2 sense cones (Bark dweller) .... *semicaecus* (Uzel)
Body colour yellowish shaded with light grey to grey-brown; head dark brown; prothorax brown; tube little shorter than head, dark brown, paler at base (Bark dweller apparently) .... *amabilis* (Bagn.)

8. Body colour yellowish, shaded grey or brown, head little paler yellow; prothorax usually little paler than pterothorax; tube as long as head, dark or greyish-brown, yellowish at base; antennal segment III with 2 and IV with 2 sense cones (Grass dweller) ... *caespitis* Uzel

9. Body longer, broader, 2-3.5 mm. long, 0.5-0.6 across pterothorax; dark brown; subcuticular pigment orange or crimson; claw on fore tarsus large 10
Body shorter, narrower 2-2.5 (0.37-0.43); dark brown; subcuticular pigment crimson; claw on fore tarsus small (fig. 25) .... *polysticti* sp. n.

10. Cheeks parallel or converging to base of head; striated, each bearing 5-8 minute hyaline hairs .... cf. *polysticti* sp. n.
Cheeks straight, converging to base of head where they form a parallel-sided neck about 0.1 length of the head, striated; each cheek bears 3-5 short, stiff, hyaline bristles. Each bristle directed forwards and placed in a ring of cuticle that projects as a minute tubercle in side view (cf. fig. 31 B); tibiae and the greater part of antennal segments III-VI yellow .... *corticis* (Degeer)
Cheeks as in *corticis* but generally slightly curved outwards, each bearing 3-6 short, stiff, dark bristles with more projecting tubercles (fig. 31 B) 11

11. Head usually broadest just behind eyes. Antennal segment III yellow, generally not shaded pale brown near apex; IV-VI blackish-brown with yellow bases; III with 3 sense cones 27-32 long; dorsal marginal pair of bristles of abdominal tergite IX 216μ; all tarsi and fore tibiae yellow, other tibiae yellow, more or less shaded brown in middle; tube about as long as head, little more than twice as long as wide, tapering evenly from base to apex which is about half the basal width; dark brown, usually paler yellowish at base and apex .... *ulmi* (Fabr.)

Like *ulmi*, but head usually broadest across middle; antennal segment III yellow, shaded pale brown dorsally near apex; the contrast between yellow and brown usually more distinct in IV-VI; III 3 sense cones 40-50 long; dorsal marginal pair of bristles of abdominal segment IX 160-170; middle and hind tibiae dark brown with yellow base and apex; tube dark brown, only faintly paler brown at base and apex ... *fungi* (Zetterstedt) (=*pini* Hal.)

12. Head brown, tube yellow (Dealated ♀♀) ... cf. (4) *pedicularius* Hal.

Head greyish-yellow, little broader than long, tube brown with yellowish base .... *semicaecus* (Uzel)

Head yellow, about as long as broad, tube brown with yellowish base .... *caespitis* (Uzel)

Head and tube yellow 13

Head and tube brown 14

13. Antennal segments I-V, head, legs, abdominal segments VI-X yellow, more or less shaded with brown; thorax and rest of abdomen brown; fore tarsal claw conspicuous; longest bristles on abdominal segment IX shorter than tube; subcuticular pigment crimson .... *pedicularius* Hal.

Antennae, legs and body yellow, shaded pale brown; fore tarsal claw minute; longest bristles on IX longer than tube; subcuticular pigment white .... *flumenellus* (Hood)

14. Body larger, 2-3.5 (0.4-0.55), dark brown; claw on fore tarsus large; subcuticular pigment orange or crimson 15

Body smaller, 1.7-2.2 (0.37-0.43), dark brown; claw on fore tarsus minute (fig. 25); subcuticular pigment bright crimson .... *polysticti* sp. n.

15. Cheeks parallel or converging towards base of head, near which they are slightly constricted; each bears 4-6 minute, hyaline, equal-sized bristles .... cf. *polysticti* sp. n.

Cheeks converging to base of head where they are slightly constricted; each bears 3-4 short, pale bristles, of which the hindmost is the strongest; tibiae yellow .... *corticis* (Degeer)

Cheeks curved and converging from eyes to form a short neck at base of head; each bears 3-5 short, strong, dark bristles with a cuticular ring projecting like a small tubercle at its base (cf. fig. 31 B) 16

16. Antennal segment III with 3 sense cones 18-24 long; dorsal marginal pair of bristles on abdominal segment IX 220μ .... 11 *ulmi* (Fabr.)
Antennal segment III with 3 sense cones 32 long; dorsal marginal pair of bristles on abdominal segment IX 175 .... 11 *fungi* (Zett.)

17. Head greyish-yellow, little broader than long; tube brown, yellowish at base .... *semicaecus* (Uzel)
Head yellow, about as long as broad; tube brown, yellowish at base .... *caespitis* (Uzel)
Head and tube yellow 18
Head and tube brown 19

18. Fore tarsal claw large; longest bristles on abdominal segment IX as long as tube; antennal segments I-III yellowish, paler than the others which are yellowish-grey .... *pedicularius* Hal.
Fore tarsal claw small; longest bristles on IX longer than the tube; all antennal segments about the same yellow shade .... *flumenellus* (Hood)

19. Body dark brown, larger (2-3:0.4-0.5); cheek with 5-8 bristles of which at least one is short and strong and placed in a projecting ring of integument; antennal segments III-VI yellow, at least at base; subcuticular pigment orange or crimson 20
Body dark brown, smaller (2:0.3); cheek with 6-8 hyaline, short, weak bristles, all about the same size; antennae brown, only III yellowish at base; subcuticular pigment bright crimson .... *polysticti* sp. n.

20. Cheeks converging to base of head and slightly constricted just before base; the bristle near the base the largest; antennal segments III-VI mostly yellow; tibiae and tarsi yellow .... 10 *corticis* (Degeer)
Cheeks bearing 5-8 strong, dark bristles, each placed in a small projecting ring of cuticle 21

21. Antennal segment III with 3 sense cones 16-21 long; dorsal marginal pair of bristles on abdominal segment IX 180-190; micropterous .... 11 *ulmi* (Fabr.)
Antennal segment III with 3 sense cones 27-40 long (micropt.), 40-50 long (macropt.); dorsal marginal pair of bristles on abdominal segment IX 135-150 (micropt.), 160 (macropt.) .... 11 *fungi* (Zett.)

*Ph. pedicularius** Haliday. Macropterous ♀ (fig. 23). Ocelli large. Head, thorax and basal segments of abdomen brown. Antennae brown with ventral surface of II, bases of III-IV or III-V yellowish or pale brown. Tibiae and tarsi yellow; femora yellow, shaded brown particularly on dorsal surface at middle. Wings pale greyish brown; forewing with 7-15 accessory cilia. Abdominal segments VIII-IX yellow, but may be shaded brown till one or both are almost as dark as the basal segments. Tube yellow, with a narrow ring of dark grey at apex and a shade of diffused brown between the yellow base and the yellow pre-apical band. It may appear as dark or darker than VII-IX, but it has the general colour of yellow, shaded with brown. Bristles yellowish-brown, dark grey at end of tube. 2-2.5 (0.45-0.5).

Micropterous ♀. Like macropterous ♀ but ocelli represented by small lenses and pigment spots or pigment spots alone or completely absent. Fore femora yellow; head may be yellow in parts.

Micropterous ♀. Like macropterous ♀ but ocelli vestigial or absent. Head and fore femora yellow; middle and hind femora, abdominal segments VII-X yellow, less shaded brown; antennal segments I-II yellow, III-V yellow at base or more or less completely brown. 1.7-2.4 (0.4-0.44).

Micropterous ♂. Like macropterous ♀.

Micropterous ♂. Like micropterous ♀ but prothorax may be yellower. 1.8-2.4 (0.35-0.5).

Colouration described from both sexes found in Aberdeenshire. As the insect grows older the brown cuticular colouration becomes darker and more spread in the yellow cuticle. No apterous adults or macropterous ♂♂ known to me.

Food is certain Basidiomycetes, especially *Stereum rugosum* and *S. hirsutum* when they are soft with water. ♀♀, ♂♂, eggs, larvae 1-12, pupae 5-8. In N.E. Scotland colonies frequently numbering hundreds and sometimes thousands of individuals occur under these fungi which live saprophytically on dead wood or bark of beech, oak, birch, elm, ash, hazel, alder, holly, *Prunus*, *Pyrus* and other trees and shrubs. The colony may persist for years. Berks, Devon, Durham, Essex, Herts, Kent, Northumberland, Oxford, Surrey. London: Keston, Woodford. Scotland: 12 counties including Haddington and Sutherland. Armagh, N. Ireland.

From a paratype and the description I consider *Trichothrips britteni* Bagnall to be micropterous ♀♀ of *Ph. pedicularius* Hal. (syn. n.) which have had their colouration rather considerably altered by chemical treatment previous to mounting.

Ph. ulmi (Fabr.). General colouration of body dark brown. Of the bristles on each cheek 3-6 are spiney bristles (fig. 31 B) each surrounded at the base by a projecting rim of integument. Postocular, prothoracic and abdominal bristles long and pointed; prothoracic posteromarginal almost as long as pronotum; longest on abdominal segments IX, X almost as long as tube; third dorsal pair on abdominal tergite IX of ♂ short and stiff; 9-14 accessory cilia on forewing, which is yellow-brown, often flecked with darker spots. Macro- or micro-pterous ♀♀, micropterous ♂♂. No apterous adults or macropterous ♂♂ known to me. Larvae 11 cream or orange coloured with two pronotal plates ill-defined at anterior.

Like Maltbaek (1931) I believe that whilst Haliday was accurate in separating *pini* (now known as *fungi*) from *ulmi*, he was not quite right in distinguishing the immature instars of the two species. Both species may occur on the same log, ♀♀, ♂♂, larvae 1-12. Small colonies of 10-20 individuals occur under dead bark or wood of gorse, broom, birch, beech, alder, elm, pine, and other trees supporting certain Basidiomycetes, especially *Peniophora incarnata* on which the insects feed when the fungus is soft with water. Almost certainly the species occurs in England, but Haliday gave no locality records and I am doubtful about the validity of other records. I have found it in Aberdeen, Kincardine, Moray and Nairn.

Ph. fungi (Zetterstedt 1828, *pini* Hal. 1837, synonymy recognised by Richter 1928). Like *ulmi* except for the differences mentioned in the key. Forewing 12-18 accessory cilia. Both sexes macro- or micro-pterous. Living larvae cream, orange or reddish coloured, with two well-defined, dark pronotal plates.

Both sexes, eggs, 1, 11, 1-12, pupae 4-8. Macropterous adults of both sexes migrate in July. Colonies of 10-300 individuals occur under dead bark or wood of gorse, broom, ash, birch, pine, oak, beech and other trees or shrubs bearing certain saprophytic Basidiomycetes, especially *Peniophora incarnata*, on which the insects feed when the fungus is wet and succulent. Haliday gave no locality records. I have found the species commonly in Aberdeen, Banff, Kincardine, Moray, Nairn, Perth, Ross, Sutherland.

*Ph. corticis** (Degeer). Body dark brown; tibiae and usually the greater part of antennal segments III-VI yellow; cheeks converging to base of head; prothoracic bristles pointed, long; wings yellowish or greyish-brown, often flecked with darker spots, and the forewing bears about 14 accessory cilia. ♀♀ macropterous 3-3.5 (0.53-0.55, micropterous 2.6-3.6 (0.45-0.48), ♂♂ micropterous 2.3-3.1 (0.4-0.48).

Adults and larvae could probably be found throughout the year. I found ♀♀ 2-10, ♂♂ 5-10, larvae 6-12, eggs 5-9. Food unknown, probably fungus. I have found colonies of 10-100 individuals under bark of dead, especially burnt birch, elder, ash, broom, gorse and other woody plants in Kincardine, Moray, Nairn and Sussex. Bagnall resorded "4 specimens" under beech bark from Epping Forest. The species is closely allied to *ulmi* and *fungi*.

Ph. flumenellus (Hood). Macropterous ♀ 2.2-2.5 (0.38). Body yellowish-brown; head dark brown; tube yellow shaded light brown; legs yellowish-brown with paler tibiae and yellow tarsi; antennal segment I dark as head, others much paler yellowish-brown, and VII and VIII may be palest; eyes about 0.3 length of head; cheeks almost smooth, each with 5-8 minute hyaline bristles; wings almost hyaline, yellowish-brown; forewing bears 7-13 accessory cilia; body bristles of moderate length, same colour as cuticle, usually pointed.

Apterous ♀ 1.7-2.1 (0.32), ♂ 1.5-1.8 (0.26). Yellow, with parts of the cuticle shaded brown. Eyes very small, only 2-3 facets in optical section. Larvae white, with no red pigment.

Hood described the species from macropterous ♀♀, apterous ♀♀, ♂♂ found in a rotting stump (of spruce ?) in New York State. I found it at Banchory, Kincardine, under bark of logs and branches of *Pinus sylvestris*, and this is the first record from Europe. I found colonies of 10-100 individuals under bark and the insect feeds on the Basidiomycete, *Polystictus abietinus*. Females, ♂♂, larvae 2-11, eggs 7-8.

Ph. polysticti sp. n. Both sexes macro- or micro-pterous (fig. 25). Greyish-brown with crimson subcuticular pigment. Antennae greyish-brown, with the base of III yellowish-brown; femora brown, tinged yellow at base and apex of ventral surface; tibiae brown, darkest on outer surface; tarsi yellow; wings hyaline; forewing bears in ♀ 10-12, in ♂ 7-9 accessory cilia; tube dark brown with yellowish base; bristles hyaline or very pale brownish-yellow, of moderate length, usually abbreviated at tip (cf. fig. 23). With the characters of the genus, but antennal segment III little longer than IV or V, tube little shorter than head, terminal bristles little longer than tube. Larvae 1, 11 pink or crimson. A more complete description will be published later.

I have found the species scattered or in small colonies under bark of dead trunks and branches of *Pinus sylvestris* bearing its food, the Basidiomycete, *Polystictus abietinus* in Kincardine, Aberdeen and Nairn. Both sexes, larvae 1-12, eggs 11, pupae 5-7.

Ph. caespitis (Uzel). The species seems to have no authentic British record, but I included it in the key to species since it is listed in Kloet and Hincks. Females macro- or a-pterous, ♂♂ apterous, larvae 1, 11 described by Priesner (1927, 28). It lives apparently on grass.

Ph. semicaecus (Uzel). Females macro- or a-pterous, ♂♂ apterous, larvae 1, 11 described by Priesner (1927, 28). Bagnall records winged adults of both sexes and larvae under willow bark in Co. Durham, " One example under bark of willow," Oxford, 2/13, " specimens " under bark of elder in Oxford and Kent.

Ph. amabilis (Bagnall). One ♀ macropterous described by Bagnall and other ♀♀ (presumably macropterous) recorded from old fencing, under bark of willow, elder, hawthorn. Surrey, Kent, Cambs, Durham. From its description it resembles *flumenellus* Hood.

More satisfactory anatomical characters than those I have been able to describe, are required to separate *caespitis*, *semicaecus* and *amabilis*.

Ph. longisetis (Bagnall). Macropterous ♀ 2-2.5 (0.34-0.38), micropterous ♂ 1.6-1.9 (0.25-0.28). Dark brown, darkest on head, femora, prothorax, sides of pterothorax and across abdominal segments VIII-X; the base of the tube yellowish-brown Antennal segments I, II as dark as head, VII, VIII almost as dark, III-VI paler brown, more or less shaded yellow at base; all tarsi and fore tibiae yellow; other tibiae yellow shaded brown dorsally in middle. Wings strap-shaped, pale yellowish-brown, without accessory cilia. Bristles hyaline or pale yellowish-brown, and many expanded and flattened at tips. Subcuticular pigment orange or reddish. With characters of genus, but antennal segment III is little longer than IV or V and like IV has two sense cones in both sexes (fig. 24). Head about as long as broad, with cheeks converging to base and bearing few minute, hyaline hairs. Fore tarsus without claw in either sex. Bristles on IX and X tapering, pointed; the longest on IX little longer than and on X twice as long as tube.

Bagnall in 1910 described a wingless (it seems likely micropterous) ♂ as *Trichothrips longisetis* sp. n. from Durham, Priesner in 1924 described a macropterous ♀ from Lower Austria as *T. maderi* sp. n. (syn. n.). I have found a few macropterous ♀♀, micropterous ♂♂ in Kincardine and Morayshire. Both sexes 5-10, under bark of dead branches of oak, pine, broom with larvae of *Ph. pedicularius* or of *flumenellus*. The species resembles *Karnyothrips longisetis* Bagn., *Haplothrips fuliginosus* Schille, *H. flavitibia* Williams and I suspect that the adults and/or larvae of the four species prey upon small Arthropoda.

Haplothrips Amyot et Serville.

Head (fig. 26) projecting in front of eyes only as a narrow vertex between the bases of the antennae, length very little more than width, about twice length of mouthcone, about 1.5 length of pronotum and of tube. Cheeks very slightly curved outwards from eye to near base of head where they are slightly constricted; each cheek marked with fine, cross striae and bearing 4-5 minute hairs. Eyes about 0.3 length of head, projecting slightly near base of antennae and separated by the width of an eye. Postocular bristle about 0.6 length of eye, pointed, set just behind middle of hind margin of eye. Ocelli set on a rounded projection of the head between the eyes, the anterior ocellus just in front of the fore margin of the eyes and closer to the lateral ocelli than these are to one another Mouthcone broadly rounded. Antennae little less than twice length of head, 8-segmented, circular area on the dorsal surface of II lies between the middle and the apex, II-V about equal in length, III asymmetrical (fig. 27 A) the outer side sloping outwards, and rather sharply bending back to apex; III with 1 and IV with 4 sense cones. Width of prothorax including fore coxae about 1.6 that of head. Prothoracic bristles abruptly pointed, anteroangular, midlateral and posteromarginal about 0.25 and posteroangular 0.5 length of pronotum. Pterothorax less than twice width of head. Legs of moderate length; fore femur enlarged in both sexes, more so in ♂ in which fore tarsal claw is larger. Both sexes macropterous; wings distinctly constricted in middle, sole-shaped (cf. fig. 12), cilia not setulose; forewing bears 3-9 accessory cilia. Abdomen elongate ellipse, tapering to apex, widest at segment III, not or scarcely broader than pterothorax. Abdominal bristles pointed; on IX the longest are a little shorter and on X little longer than the tube. The 3rd dorsal bristle of IX in the ♂ is short and strong. Sigmoid bristles on abdominal tergites II-VII are strong and dark. Tube about twice as long as broad at base which is twice width at apex; base parallel-sided for short distance after which sides contract and taper to apex; marked with cross striae on basal third and bearing 3-4 minute, hyaline hairs. Subcuticular pigment crimson.

Type species *aculeatus* (Fabricius).

Key to Species.

1. Antennal segment III asymmetrical (fig. 27 A). Wings clearly constricted in middle, sole-shaped, but reduced in some species. Long bristles of body pointed and abbreviated at tip (fig. 26) or rounded and flattened at tip (fig. 28) depending on species, position and sex. Mouthcone broadly rounded at apex. Fore femur may be greatly enlarged in ♂. Fore tarsus usually bears

a tooth on ventral surface of first segment in both sexes besides the other claw or claws usually found on the tarsus of Phlæothripidae (fig. 26). General colour dark brown with crimson subcuticular pigment 2
Haplothrips A. & S.

Antennal segment III symmetrical or almost so, wings clearly or scarcely sole-shaped 2

Antennal segment III bilaterally symmetrical (fig. 27 B); wings but slightly constricted in middle 10
sub-gen. *Xylaplothrips* Pr.

2. Macropterous 3
Wings reduced .... cf. *statices* f. *morisoni* Pr.

3. Cilia of wings not setulose 4
Cilia of wings somewhat setulose (fig. 28) 18
setiger Pr.

4. Antennal segment III slightly asymmetrical, lacks sense cone 11
sub-gen. *Zygothrips* Uzel
Antennal segment III with 1 sense cone 5
Antennal segment III, generally slightly asymmetrical, with 2 and IV with 4 sense cones 12
Antennal segment III symmetrical, with 2-3 sense cones 10

5. First segment of fore tarsus with small tooth on ventral surface (fig. 26) 6
First segment of fore tarsus without tooth or with very minute tooth on ventral surface 7

6. Postocular bristles pale, apparently pointed, 0.6 length of eye ... 8
Postocular bristles dark, round tipped (fig. 28), 0.75 length of eye 9

7. Prothoracic anteroangular, midlateral, posteroangular and posteromarginal bristles conspicuous, pale, apparently pointed (fig. 26) 8
Dark, round tipped 9

8. Head 1.4-1.5 length of tube; antennal segments III-V paler than the rest; tarsi yellowish-brown; fore tibia yellowish at apex ....
aculeatus (Fabr.)

9. Head 1.4-1.5 length of tube; III yellow, IV-VI pale brown; tarsi yellow; tibiae yellow faintly shaded brown dorsally in middle ....
flavitibia Williams
Head 1.5 length of tube; III yellow, shaded brown dorsally at apex; IV-VI yellow in basal ventral portions, or some totally brown; fore tarsi yellow, others brownish-yellow; tibiae brown except for yellowish apices; anterior marginal prothoracic bristle 25-35 long .... *subtilissimus* (Hal.)

10. Antennal segment III with 2 and IV with 2 (or rarely 4) sense cones; postocular bristle ♀ 54-62, ♂ 46-54, prothoracic anteroangular ♀ 40-50, ♂ 38-44; outer posteroangular ♀ 70-80, ♂ 65-70; mediodorsal bristle of abdominal segment IX tapering, pointed .... (*X.*) *fuliginosus* (Schille)

Antennal segment III with 3 and IV with 4 sense cones; postocular bristle ♀ 94-102, ♂ 91, prothoracic anteroangular ♀ 70-72, ♂ 67, outer posteroangular ♀ 123-166, ♂ 98 .... (*X.*) *subterraneus* Crawford

11. Head 1.5 length of tube; postocular bristle pale yellow, pointed, as long as eye; antennal segment IV with 2 sense cones; III yellow, IV-VI yellow in basal ventral portions; prothoracic anteroangular 40, posteroangular 73, brown, round tipped; tarsi yellow; tibiae yellow, shaded brown towards base; fore tarsal tooth absent .... (*Z.*) *minutus* (Uzel)

12. Postocular bristles long, distinctly visible, often projecting beyond the sides of the head 13

Postocular bristles very small, sometimes larger, in the ♀ never overhanging the sides of the head 20

13. Anteroangular bristles of pronotum at least 30 long 14

Anteroangular bristles of pronotum less than 25 long; most body bristles rounded and flattened at tips (fig. 28) 18

14. Posteroangular bristles of prothorax apparently pointed (fig. 28, H. dist.) 15

Posteroangular bristles of prothorax rounded and flattened at tip like most of the body bristles (cf. fig. 28, H. subt.) 19

15. Postocular bristle little longer than eye, apparently pointed, tapering (fig. 28, H. dist.) 16

Postocular bristle shorter than eye, apparently pointed, tapering 17

16. Head about as long as broad, in ♀ about 1.2 length of tube; antennal segments III-VI yellow, at least at base of each segment; body bristles long, brownish-yellow or hyaline, tips apparently pointed (fig. 28), prothoracic anteroangular 50, posteroangular 95 .... *distinguendus* (Uzel)

Head ♀ little broader than long or ♂ longer than broad, little longer than the tube; antennal segment III yellowish-brown, IV yellowish at base or like V totally brown, but paler than the other brown segments. Eyes separated by the width of 1.5 eye. Postocular bristle set about 0.4 length of eye from hind margin of eye; prothoracic anteroangular 60-65, posteroangular 110-120, pale yellow .... *marrubiicola* Bagn.

17. Head little longer than broad, ♀ 1.4-1.6, ♂ 1.3-1.4 length of pronotum, ♀ 1.5-1.7, ♂ 1.1-1.4 length of tube; postocular bristle 0.5-0.8 length of eye; antennal segment III yellowish-brown, IV-V or VI yellowish-brown, paler at bases; prothoracic anteroangular 30-40, posteroangular 65-80 pale brownish-yellow .... *juncorum* Bagn.

Head ♂ little longer than broad, 1.6 as long as tube; antennal segments III-IV paler brown than the others; postocular bristle little shorter than eye; prothoracic posteroangular 45-50 .... *juncicola* Bagn.

18. Postocular bristle 0.7-0.8 length of eye; head broader than long or little longer than broad, ♀, ♂ 1.4-1.7 as long as pronotum, ♀

1.4-1.5, ♂ 1.2-1.3 as long as tube; antennal segment III yellowish-brown, IV brown, with yellowish base in ♂; prothoracic bristles, anteroangular 12-16, posteroangular 60-73; wing cilia somewhat setulose (fig. 28); body bristles tip rounded in one plane (cf. fig. 28, H. subt.) and narrower tipped in ♂ than ♀ .... *setiger* Priesner

Like *setiger*, but prothoracic posteroangular, the first bristle on the base of the forewing and various other body bristles pointed; wing cilia probably setulose .... cf. non British *kraussei* Pr.

19. Postocular bristle 0.8-1.1 length of eye; head little longer than broad, 1.2 as long as pronotum, ♀ 1.4-1.5, ♂ 1.2-1.3 as long as tube; antennal segments III-VI yellowish at base; prothoracic bristles, anteroangular 35-47, posteroangular 67-80 (cf. fig. 28, H. subt.); fore tarsus yellow like apex and most of fore tibia; other tarsi yellowish-brown, paler than tibiae; wings hyaline; forewing with 8-11 accessory cilia .... *senecionis* Bagn.

Postocular bristle 0.3-1.0 length of eye; head little longer than broad, 1.2-1.3 as long as pronotum, ♀ 1.3-1.6, ♂ 1.2 as long as tube; antennal segment III yellow, shaded brown or totally brown, IV with yellowish base or totally brown, often paler than V; prothoracic bristles, anteroangular 20-40, posteroangular 64-74 (fig. 28); fore tarsus yellow or yellowish-brown like apex or most of fore tibia; other tarsi brown, as dark as tibiae; wings yellowish-brown; forewing bears 4-14 accessory cilia .... *statices* (Haliday)

Like *statices* but wings reduced .... *statices* f. *morisoni* Pr.

Female: postocular bristle about 0.8 length of eye; head little longer than broad; 1.3-1.4 as long as pronotum, 1.3-1.5 as long as tube; antennal segments III-V paler at base which is yellow or brown; prothoracic bristles, anteroangular 35, posteroangular 68; fore tarsi yellowish-brown, mid and hind tarsi as dark as tibiae; wings hyaline; abdominal segment IX mediodorsal bristle pale, 0.6-0.7 length of tube, tip rounded. Antennal segment III with 3 or 4 cross striae near base more conspicuous than in previous two species .... not British *tritici* Kurdj.

20. Pronotal anteroangular bristle 25-50 long, midlateral 28-40 21

Pronotal anteroangular bristles less than 25 long, midlateral under 20 if developed 22

21. Postocular bristle 0.3-1.0 length of eye .... cf. *statices* (Hal.)

22. Postocular bristle 0.12-0.4 length of eye 23

23. Postocular bristle ♀ 0.25, ♂ 0.4 length of eye; head little longer than wide; ♀ 1.3-1.6, ♂ 1.2-1.5 as long as pronotum, ♀, ♂ 1.1-1.2 as long as tube; antennal segment III yellowish ventrally near base, IV and in some specimens V may have small yellowish area ventrally near base; III ♀ 1.7-1.9, ♂ 2-2.3 as long as wide; prothoracic bristles, anteroangular 12, posteroangular 27; wings yellowish-brown; tube ♀ 2.6-3, ♂ 2.8-3 as long as wide at base .... *leucanthemi* (Schrank)

Postocular bristle ♀ 0.16, ♂ 0.3 length of eye; head little longer than wide; ♀ 1.4-1.6, ♂ 1.4-1.5 as long as pronotum; ♀ 1.25-1.3, ♂ 1.1-1.2 as long as tube; antennal segments III-IV coloured as in *leucanthemi*; III ♀ 2-2.3, ♂ 2.2-3 as long as wide; prothoracic bristles, anteroangular 12, posteroangular 20-27; wings pale yellowish-brown or grey with darker base, paler than in *leucanthemi*; tube ♀ 2.4-3, ♂ 2.8-3 as long as wide .... *angusticornis* Pr.

Female: Postocular bristle, when visible, 0.12 length of eye; head little longer than wide; 1.4-1.5 length of pronotum, 1.2 as long as tube; antennal segments III-IV coloured as in *leucanthemi* but they are frequently totally brown, with III little paler than the other segments; prothoracic bristles, anteroangular 13, posteroangular 32-40; wings pale greyish-brown with darker base; III 1.8-2 as long as wide; tube 2-2.6 as long as wide at base .... *niger* (Osborn)

H. aculeatus (Fabr.). Described under genus and key to species. Body dark brown; wings and body bristles hyaline. ♀♀ 1.6-2.1 (0.27-0.32), ♂♂ 1.6-1.7 (0.25-0.3).

Bagnall found both sexes in sedge stacks in September in Oxfordshire and I found 1 ♀, 2 ♂♂ in May amongst grass and reeds in Norfolk. Widely distributed and common in many European countries where the larval hosts are certain species of Gramineae and Cyperaceae. The species is sometimes of economic importance to cereals on the Continent, and both sexes may be found throughout the year.

*H. flavitibia** Williams. Brown; fore tarsus without tooth; wings pale yellowish-brown and forewing bears 6-9 accessory cilia; abdominal segment IX ♂ with 3rd dorsal bristle short and stiff. ♀ 1.45, ♂ 1.5 (0.25).

Probably predacious on small Arthropoda. Williams found 6 specimens (presumably ♀♀) on *Crataegus* at Merton, Surrey, and I found 1 ♂ on *Crataegus* in July in Herts.

*H. subtilissimus** (Hal.). Brown; fore tarsus usually without tooth, and if this is present it is very minute; wings pale brown, forewing with 7-10 accessory cilia. ♀♀ 1.7-2.1 (0.3-0.32), ♂♂ 1.4-1.7 (0.25-0.28).

Occurs chiefly on *Quercus robur* and *petraea*, found also on apple, elm, and other species of trees. Often numerous. Larvae and probably adults predacious on small Arthropoda and their eggs. I have found ♀♀, ♂♂, larvae 7-9, but adults could probably be found throughout the year. Bucks, Berks, Essex, Herts, Middlesex, Northumberland, Surrey, Wilts. London: Kew, Epping Forest.

H. (*X.*) *fuliginosus* (Schille). Dark brown, with the bases of antennal segments III-VI (fig. 27 B) yellowish-brown, with the yellowish area largest in III and progressively reduced in the other segments, but in some specimens the yellow exists only in the pedicillate base of III; all tarsi, the apex and the inner side of fore tibia, the extreme apices of the other tibiae and the apex of the tube paler yellowish-brown. Forewing dark brown at base, and a pale brown patch between this dark area and the constriction of the wing; the rest of the wing very pale brown or hyaline; it bears 5-8 accessory cilia. Longest hair on IX as long and on X little longer than the tube. ♀♀ 1.6-2.5 (0.27-0.34), ♂♂ 1.4-1.8 (0.22-0.25).

Larvae and adults probably predacious on small Arthropoda. I have found larvae scattered on dead gorse, broom and branches of trees. Bagnall's record (1915, *Vasculum*, I, 127) of larvae of *H. obscuripennis* in Northumberland almost certainly refers to *H. subtilissimus*. Adults occur scattered or in groups of 5-8 under bark of dead branches of broom, gorse, elm, birch, oak, juniper and Sorbus. Some occur on flowers or green herbage during July, the migrating period. Both sexes 1-12, larvae 5-7. Bagnall records from Oxford and Warwick, I from Bucks, Berks, Hunts, Norfolk, Aberdeen, Kincardine, Moray, Perth.

In Morayshire under birch bark I found 1 ♂ which has antennal segment IV bearing 4 sense cones, a character of *subterraneus*.

H. (*X.*) *subterraneus* Crawford. Colouration like *fuliginosus*, but fore femur yellowish in distal fourth, and apices of middle and hind tibiae are tinged yellow. Descriptions and measurements are taken from the description of the species by Crawford and by Kurosawa. ♀♀ 2.2 (0.35), ♂♂ 1.8 (0.34). Described by Crawford from both sexes found on lily bulbs imported into U.S.A. from England and by Kurosawa (March 1938, *Zool. Mag. Japan*, 50, 154) as *Trichothrips liliorus* sp. n. on lily bulbs in Japan and Korea. Kurosawa recognised the synonymy and the priority of Crawford's naming in a reprint he sent me in 1938, but the synonymy seems not to have been published. Both authors attribute injury to lily bulbs by this species, on what seems to me inconclusive evidence. They found it with the Lily thrips, *Liothrips vaneeckei* Pr. and I suspect that the adults and/or larvae are more likely to prey on the larvae of the lily thrips than on lily bulbs. No locality record available for Britain.

H. (*Z.*) *minutus* (Uzel). Dark brown; antennal segment III yellow, IV-VI yellow or more or less brown on apical portions; fore tibiae mostly yellow; other tibiae yellow, more or less shaded brown towards bases; tarsi pale yellow; fore tarsus without tooth; wings hyaline; forewing bears 6-8 accessory cilia; head scarcely longer than broad. ♀♀ 1.1-1.9 (0.32), ♂♂ smaller. The ♂♂ particularly need investigation.

The species is probably predacious on small Arthropoda. I found 1 ♀ on herbage, July 1938, Sutton Bonington, Notts.

*H. distinguendus** (Uzel). Dark brown; fore tarsi and at least base of fore tibiae yellow; wings hyaline; forewing with 9-12 accessory cilia; head varying from little broader than long to little longer than broad; longest bristles on IX almost length of tube. ♀♀ 1.8-2.4 (0.35-0.4), ♂♂ little smaller.

Larval hosts include thistles, adults seem to favour flowers of Compositae. Bagnall recorded 1 ♀, Oxfordshire, 8/13, ♀♀, ♂♂, 11, Surrey, *Carduus* sp. I found 2 ♀♀ in Middlesex in June on Compositae and larvae and pupae in Essex in July in flowers of *Cirsium palustre*. London: Warley.

H. marrubiicola Bagnall. Dark brown, fore tarsus yellow, fore tibia yellow, shaded brown on outside and inside and darkest near base; wings hyaline; forewing has 6-10 accessory cilia. ♀ 1.85 (0.4), ♂♂ 1.6-1.7 (0.32-0.34).

On 29.6.30 at Rye, Sussex, I found 2 ♂♂ on *Scirpus maritimus* and 1 ♀, 15 ♂♂, 12, I larvae on *Marrubium vulgare.* Bagnall described the species from the adults on *Marrubium.* Larval host uncertain. The larvae may not be this species.

*H. juncorum** Bagnall. Dark brown; fore tarsus and apex of tibia yellowish-brown, other tarsi brown; wings pale brown or hyaline, 6-11 accessory cilia. ♀♀ 2-2.6 (0.32-0.38), ♂♂ 1.6-2.2 (0.3-0.36).

I have found ♀♀, ♂♂, larvae 6-9, but some stages could probably be found on plants throughout the year. Larval hosts include *Juncus* spp., *Scirpus maritimus, Carex vulpina.* Sometimes numerous on host plants. Berks, Dorset, Essex, Hants, Kent, Lancs, Norfolk, Oxford, Surrey, Sussex. London: Epping Forest.

*H. juncicola** Bagnall. Male dark brown; fore tibiae distally and fore tarsi shading to pale yellowish-brown. Size not given.

On 28.9.27 at Oxshott, Surrey, I found a small ♂ which Bagnall described as sp. n. The insect occurred on *Juncus* sp. which I called *communis* but which was probably *effusus* L. It was not well mounted and is possibly a gynaecoid ♂ of *juncorum* or of another species.

*H. setiger** Priesner. (Fig. 12 wrongly named *kraussei* Pr.) Dark brown; fore tarsus and apex of tibia yellowish-brown; wings hyaline or pale brown; forewing has 6-8 accessory cilia. The long bristles of head. prothorax, front wings and abdomen taper to their tips, which are pointed in side view and slightly expanded and rounded in dorsal view (cf. Fig. 28, H. subt.). The tip is hyaline, the shaft is more or less dark. This is the type of bristle found on *H. aculeatus* (fig. 26) and it is more acutely pointed in *distinguendus* (fig. 28). ♀♀ 1.9-2.4 (0.32-0.4), ♂♂ 1.9-2.2 (0.3-0.37).

I referred to this species as *kraussei* earlier in this paper when discussing gregariousness—adults and their larvae make up the numbers found on Compositae. I first found the species in Britain in 1938. It often occurs in hundreds on its larval host plants, which include *Senecio squalidus, viscosus, jacobaea, Erigeron canadensis, Crepis capillaris, Matricaria inodora, Leontodon autumnalis* and *Achillea millefolium.* Adults and larvae may also be found on species of plants other than Compositae, but growing near Compositae. Adults fly readily in hot sunshine. Species probably overwinters as larva II. Both sexes, larvae 5-10. Essex, Herts, Hunts, Middlesex. London: City, Hyde Park, Stoke Newington, Finsbury, S. Kensington, Little Heath.

H. kraussei Priesner. Not British but mentioned because of its close resemblance to *setiger.*

H. senecionis Bagnall. Dark brown. ♀♀ 2.1-2.5 (0.35-0.42), ♂♂ 1.6-1.8 (0.32-0.37).

Often occurs in hundreds on larval hosts, *Senecio jacobaea*, *S. aquaticus*. ♀♀ 5-9, ♂♂ 5-8, eggs 6-8, larvae 6-5, pupae 5. Eggs laid between florets. Occurs from sea shore to at least 30 miles inland in Scotland and at an elevation of at least 1000 feet. Cheshire, Durham, Lancs, Norfolk, Northumberland, Yorks, Aberdeen, Ayr, Banff, Inverness, Kincardine, Moray, Nairn, Perth, Ross, Stirling. E. Cameron (1935) deals with the natural control of *S. jacobaea* and mentions this species as *H. distinguendus* Uzel. It is called *H. distinguendus* by Sharga (1933), who describes the internal anatomy of adults.

H. statices (Haliday). Dark brown. ♀♀ 2.2-2.7 (0.4-0.43), ♂♂ 1.9-2.2 (0.35-0.37).

One generation in the year. ♀♀ 5-9, ♂♂ 5-8, eggs 6-7 (fig. 6), larvae 1-12, pupae 5-6. Often occurs in hundreds on larval host plants *Armeria maritima*, *caespitosa*, et spp. Altitudinal range from plants submerged twice daily by normal high tide to those growing in gardens in Scotland at least 500 ft. above sea and 30 miles inland. Distribution is probably helped by trade in *Armeria* plants. Bucks, Herts, Lancs, Norfolk, Aberdeen, Banff, Kincardine, Moray, Ross, Antrim, Co. Down.

Like Bagnall I consider *statices* Hal. (=*armeriae* Maltbaek and *morisoni* Pr.). *H. morisoni* varies in size, colouration and chaetotaxy like *statices* and the larvae I-II of the two forms are morphologically identical. The wings of *morisoni* are reduced and vary from minute scales to hemimacroptera without any close correlation between size of wing and degree of ciliation and chaetotaxy. The instars occur, often in hundreds, during the same months as *statices* on *A. maritima* in salt marshes or amongst rocks along the coast of Aberdeen, Moray, Ross, Skye and Outer Hebrides. Plants and insects will thrive and multiply when introduced from a salt marsh to an inland garden, but I have not found macroptera amongst the progeny of the thrips during three years after introduction. And whilst adults of *statices* and *morisoni* live on the same species of plant in similar habitats, at least along the coast, I have not found them together, nor have I found microptera developed from macroptera colonies inland.

On the Kincardineshire cliffs the larvae of *Aeolothrips tenuicornis* Bagn. and or *Ae. ericae* Bagn. are abundant on *Armeria maritima* and they preyed upon and apparently exterminated the larvae of *morisoni* within two years after I had introduced many hundreds of *morisoni* to these plants in different places. Neither *statices* nor *morisoni* occur on these plants frequented by large numbers of *Aeolothrips*. Normally sheep and rabbits exercise much control of these insects by feeding on the plants, and almost certainly they swallow several thrips.

H. tritici Kurdjumov. Dark brown; ♀ about 2 mm. long; forewing has 5-8 accessory cilia. Not recorded from Britain but described in this paper because it resembles some other species closely, and I think it may occur in East Anglia. Hosts are cereals and certain species of grass.

H. leucanthemi (Schrank). Dark blackish-brown; fore tarsus varies from yellow to dark brown; if it is yellow the apex of the fore tibia is the same colour and in ♂♂ the colour may extend almost to the base; mid and hind tarsi dark brown like the legs; forewing has 7-12 accessory cilia; body bristles of *leucanthemi*, *angusticornis* and *niger* shaped like those of *aculeatus* and *setiger*; they are narrow at the tip and usually appear pointed. ♀♀ 1.9-2.5 (0.35-0.45), ♂♂ 1.8-2 (0.35-0.37).

Common and widely spread on larval host, *Chrysanthemum leucanthemum*. Cambs, Hunts, Suffolk, Surrey. Almost certain to occur in the London Area. Life history probably like that of *angusticornis*. I have found both sexes May-June.

H. angusticornis Priesner. Dark blackish-brown; legs coloured as in *leucanthemi*; 6-13 accessory cilia on forewing; ♀♀ 1.9-2.6 (0.35-0.45), ♂♂ 1.6-2.2 (0.27-0.4).

May occur in hundreds on larval host, *Achillea millefolium*, and during June-July after adults have emerged from pupation in plant debris or in the soil, they may be found in large numbers on various species of plants, particularly Compositae near millefoil. Derby, Norfolk, N. England, Staffs, Warwick, Yorks, Aberdeen, Ayr, Banff, Inverness, Kincardine, Moray, Nairn, Ross. ♀♀ 6-9, ♂♂ 6-8, eggs 7-8, larvae 7-4.

H. niger (Osborn). Dark blackish-brown; legs coloured as in *leucanthemi* at least in ♀♀; forewing has 4-8 accessory cilia. ♀♀ 1.9-2.2 (0.32-0.37), ♂♂ smaller.

Often numerous on larval hosts which include *Trifolium* spp., *Anthyllis*, *Lotus*, *Plantago lanceolata*. Females 5-9. I am uncertain about the dates of the other stages. Bucks, Durham, Kent, Norfolk. Surrey, Yorks, Aberdeen, Banff, Moray.

Neoheegeria Schmutz.

Head somewhat longer than broad and longer than the prothorax. Antennae 8-segmented, more than 1.5 length of head. Mouthcone reaching to or beyond middle of prosternum, drawn to sharp point at apex. Both sexes macropterous, forewing constricted in middle, sole-shaped. Fore femur somewhat enlarged. Fore tarsus with very small tooth on ventral surface of segment I in female and a larger one in male. Abdominal sternite IX in male produced backwards over base of tube as a short flap; the 3rd dorsal bristle of tergite IX is short and strong. Body bristles very long, curved, with tips hyaline and flattened in the dorsoventral plane as in *Haplothrips* (cf. fig. 28). Subcuticular pigment red.

Type species *dalmatica* Schmutz. Not British.

N. verbasci (Osborn). Dark brown; antennal segments I, II dark brown, III-VI yellow, VII brownish-yellow, VIII brown; fore tibia yellow, shaded brown on outer and inner sides; fore tarsus yellow, other tarsi yellowish-brown; wings hyaline; forewing bears 7-12 accessory cilia. Head about 1.1 as long as broad, ♀ 1.4, ♂ 1.2-1.5 as long as pronotum, ♀ 1.25, ♂ 1.1-1.3 as long as tube; cheeks only slightly curved outwards; antennal segment III with 2 and IV with 4 sense cones; eyes about 0.4 length of head, separated by the width of an eye; ocelli placed between eyes; postocular bristle longer than eye; prothorax little broader than head, with anteromarginal, anteroangular, midlateral, posteromarginal, posteroangular and fore coxal bristles, curved, brown with hyaline tips (fig. 28) and 0.5-0.75 length of pronotum; pterothorax and abdomen have structure common to family; tube 2.5 as long as wide at base, nearly twice as wide at base as at apex. ♀♀ 1.7-2.3 (0.32-0.4), ♂♂ 1.4-2 (0.27-0.33).

Breeds on *Verbascum* spp. in U.S.A. and in Europe. Bagnall records it as British on the testimony of Osborn, who described it from U.S.A. in 1897. Osborn informed Bagnall in 1912 that he had seen it on *Verbascum* near Stratford-on-Avon.

Euphlœothrips n.n. for *Phlœothrips* A. & S.

Hood and Priesner have noted that owing to the variability of certain species it is very difficult to decide on characters for separating genera in the group (including *Acanthothrips*, *Euphlœothrips* and *Hoplandrothrips*) characterised by having a long pointed mouthcone, cheeks with warts or tubercles each bearing a bristle, fore femora enlarged in both sexes, wings macropterous, not constricted in middle, bristles with expanded tips, red subcuticular pigment and red larvae which, as far as is known for the British species, have bristles with expanded tips as in the adults and bear a pair of processes like either horns or knobs on the front of the head below the antennae. Microtrichia are borne by the larvae of *E. coriaceus* Hal. and *A. nodicornis* Reut. but their numbers and distribution on the larvae of other species and on adults seems of little use for separating genera.

Since I have taken *pedicularius* Hal. instead of *coriaceus* Hal. as the type of *Phlœothrips* Hal. and since it seems ncessary to place these species in different genera, I erect *Euphlœothrips* nomen nov. for *Phlœothrips* A. & S. with type species *coriaceus* Hal. Amyot and Serville (1843) described *Phlœothrips* Hal. with *coriacea* Hal. as the first species described, as they considered *pedicularia* a larva and therefore invalid. Uzel (1895) defined *Phlœothrips* Hal. to include *coriacea* and three other species. Hood (1912) took *coriaceus* as the type of *Phlœothrips*, but he did not define the genus. Priesner (1927, 28) recognises *coriaceus* as the type species of *Phlœothrips*, under which he includes four sub-genera.

Euphlœothrips n. n.

Macropterous ♀. Head (fig. 29) about 1.2 longer than broad, little longer than mouthcone, 1.7 length of pronotum and scarcely longer than tube; cheeks almost parallel, but curving in rather abruptly to eyes and more gently near base of head; either has 4-8 prominent warts, each bearing a minute bristle directed forwards; these bristles about equal in size. Eyes not projecting, about 0.4 length of head and separated by the width of an eye. Ocelli on an elevation of the head between the eyes; each ocellus at the angle of an an equilateral triangle, with the front ocellus just behind the anterior margin of the eyes. Mouthcone pointed at apex, reaching the front margin of the mesosternum, with the mandibular stylet extending far beyond the apex of the cone. Antennae inserted directly in front of eyes and closely approximated, about twice length of head, 8-segmented, with III the longest, longer than I plus II and about three times longer than wide; the following segments progressively shorter, III with 3, IV with 4 long sense cones. Prothorax, including fore coxae about twice as wide as length of pronotum. Pterothorax very little wider than prothorax. Fore femora enlarged in both sexes and bearing warts on the inner dorsal surface. Warts smaller than those on cheeks; each bears a small hair. Fore tibia on inner side at apex produced into a thickened claw-like point. Fore tarsus bears a claw in both sexes. Wings strap-shaped, not constricted in middle; forewing has 24-28 accessory cilia and at base 3 bristles, of which the first two have expanded tips and the third is about twice the length of either of them and has a tapering, pointed tip. Abdomen elongate oblong, scarcely broader than pterothorax, tapering to apex. Tube almost parallel-sided, but expanded at base and contracted at apex; width at base twice that at apex; length is about 3.5 greatest width; set with about 30 minute hairs. Dark striae anastomose transversely and form a reticulum on the cuticle of the head and most sclerites of thorax and abdomen. They are fainter on tergites VIII-IX, and the tube is smooth except for transverse striae at the sides near base. Striae also occur on antennal segments and legs. On the sides of abdominal tergites II-VII arising from the striae are some microtrichia. Bristles; brownish-yellow, expanded at the tips (fig. 29); postocular about half length of eye, prothoracic posteroangular about half length of pronotum; two pairs of sigmoid bristles on each of tergites II-VII; the usual arrangement of long bristles present on I-X; the longest on IX about half the length of the tube; the longest terminal bristles are brown at base, hyaline at apex, pointed, not quite length of tube. Subcuticular pigment crimson.

Macropterous ♂. Like ♀, but smaller and the 3rd marginal pair of bristles on abdominal tergite IX is short and stiff.

Type species *coriaceus* (Haliday).

Described from 1 ♀, Balsall Common, Warwickshire, 9/1913, R. S. Bagnall; and 1 ♂, Bagley, Shropshire, 7/8/1912, C. B. Williams.

Key to Species.

Either cheek bearing 5-8 prominent warts, each with a minute bristle directed forwards (fig. 29); head very little longer than tube; ♀♀ 2.3-3.5 mm.; postocular bristle 54, fore coxal 54, prothoracic posteroangular 110 long .... *coriaceus* (Haliday)

Either cheek bearing 8-12 prominent warts, each with a minute bristle; head very little shorter than tube; ♀♀ 3.4-3.8 mm.; postocular bristle 90, fore coxal 90, prothoracic posteroangular 148 long ...... *immanis* (Bagnall)

E. coriaceus (Haliday). Dark brown; antennal segment II paler at apex, III yellow, shaded brown at apex, IV-VII yellow or paler brown in basal portions than in the rest of each segment; tarsi yellow or yellowish-brown; tibiae yellow at base and apex, dark brown in middle, with the fore tibia the palest; wings pale brownish-yellow; forewing with darker brown area across middle. ♀♀ 2.3-3.5 (0.56-0.6), ♂♂ 2-3 (0.5-0.6).

Food unknown; perhaps fungus. Adults recorded as occurring throughout the year in Europe, with immature instars often in fairly large colonies under bark of dead trees of many species. Bagnall has recorded the species from Bucks, Durham, Essex, Hants, Kent, Northumberland, Oxford, Surrey, Sussex, Warwick. I have not found the species but I have seen adults and larvae taken by C. B. Williams in Herts and 1 ♂ in Salop and there is a published record for Glos. Almost certain to occur in the London Area.

E. immanis (Bagnall). Like *coriaceus* in colouration and apparently in habits. Both sexes found by Bagnall, who records the species from Durham, Oxford, Surrey. The species resembles *coriaceus* so closely that its specific characters may be those associated with large individuals of *coriaceus*. Knowledge of the external anatomy of the larvae would help in settling its specific status.

Hoplandrothrips Hood.

Mouthcone pointed; cheeks with 3-8 tubercles, each bearing a bristle; these bristles about equal in size; cuticle of head marked with confluent striae; fore femur enlarged in both sexes, with two subapical teeth in male, none in female; fore tibia with tooth near base on inside in male, not in female; fore tarsus with tooth in both sexes; wings not constricted in middle. Antennae 8-segmented, III with 3 and IV with 4 sense cones.

Type species *xanthopus* Hood. Not British.

It is impossible for me to write a satisfactory key to all the British species, as I have no specimens of *bidens* Bagn., *collinsi* Bagn. and perhaps *parvulus* Bagn. and Bagnall's descriptions of these species are inadequate.

Key to Species. Females.

Antennal segment III not or only very slightly curved in towards axis near middle of inner surface (cf. fig. 30); postocular bristle 0.3-0.5 (44-56μ) length of eye; either cheek bearing 3-6 small tubercles, each carrying a small bristle directed forwards (cf. fig. 31 A); these bristles dark, rather stout, and the ones near the base of the head the largest; head length 1-1.3 that of tube; prothoracic anteroangular bristle 44-56, posteroangular 78-90; basal bristles of forewing, I 40-50, expanded tip, II 50-56, tip like I (fig. 28, H. ann.), III 56-68 less expanded tip than I .... *annulipes* (Reuter)

Antennal segment III usually deeply curved in towards axis near middle of inner surface (fig. 30); postocular bristle about 0.8 (78-95) length of eye; either cheek bearing 6-8 small tubercles, each carrying a short bristle directed forwards (fig. 31 A); these bristles dark, rather stout and about equal in size; head length 1.4-1.6 that of tube; prothoracic anteroangular bristle 56-84, posteroangular 84-95; basal bristles of forewing I 67-80, expanded tip, II 80-100, tip like I, III 90-112, tip like I but narrower .... *ellisi* Bagnall

Key to Species. Males.

1. Fore femur and tibia unarmed 2
   Fore femur with 2 teeth near apex, tibia with tooth on inside at the end of the basal third 3
   Fore femur with 2 teeth near apex, tibia unarmed 4
2. Antennal segment III not or only slightly curved in towards axis near middle of inner surface (cf. fig. 30); postocular bristle 0.7-0.85 (72-95μ) length of eye; either cheek bearing 3-6 small tubercles, each carrying a short bristle directed forwards (cf. fig. 31 A), one at the base of the head about three times as thick as any one in front; head 1.3-1.4 length of tube; prothoracic anteroangular bristle 66-112, posteroangular 78-95, basal bristles of forewing I 56, tip expanded, II 50, tip like I (cf. fig. 28 H. ann.), III 56, tip narrower than I .... *annulipes* (Reuter)
   Antennal segment III with shallow curve in towards axis near middle of inner surface (cf. fig. 30); postocular bristle almost as long (72) as eye; either cheek bearing 5-7 small tubercles, each carrying a short bristle directed forwards, the bristles coloured like the cuticle and differing very little in size; head length 1.5 that of tube; prothoracic anteroangular bristle 72, posteroangular 72; basal bristles of forewing, I 56, II 72, III 56, all with tips expanded .... probably *parvulus* (Bagnall)
3. Antennal segment III usually deeply curved in towards axis near middle of inner surface (cf. fig. 30); postocular bristle 1.1-1.2 (100-118) length of eye; either cheek bearing 6-8 small tubercles, each carrying a short, stout bristle pointing forwards (cf. fig. 31 A); bristles near base larger than those near front of head, or all bristles about equal in size; head length 1.5-1.7 that of tube; prothoracic anteroangular bristle 95-140, posteroangular 72-88; basal bristles of forewing, I 56-80, II 78-100, III 66-112, tips expanded, III the least .... *ellisi* Bagnall
4. Antennal segment III clavate; cheek bearing minute spines; head 1.1 times as long as broad, 1.6 times length of tube; middle and hind tibiae dark brown .... *collinsi* Bagnall
   Antennal segment III with pit in middle of inner surface; postocular bristle almost as long as eye from illustration, 70-95; either cheek with 3-4 spine-set warts; prothoracic anteroangular bristle exceptionally long, posteroangular 70-95; basal bristles of forewing, I 62, tip expanded, II 62, tip expanded, III 81, pointed; middle and hind tibia brown with yellow base and apex .... *bidens* (Bagnall)

H. annulipes (Reuter). Dark brown; antennal segments III-V or VI yellow at base; tarsi yellowish-brown; fore tibia yellow at apex and on the undersurface, and in some specimens at base; mid and hind tibiae yellow at base and apex; wings brownish-yellow, with fore pair little darker in middle and bearing 10-18 accessory cilia. Fore tibia in female has cuticle at apical inner angle thickened and produced to a point as in *E. coriaceus*; in male with strongly developed fore legs the thickening and production may be like a claw opposite the large tarsal claw. Subcuticular pigment crimson. The larvae are easily separated from those of *ellisi*. ♀♀ 2-3.4 (0.42-0.5), ♂♂ 2-3 (0.4-0.48).

Quite common in Aberdeen, Kincardine, Moray and Ross. Apparently only one generation in the year, with both sexes occurring 5-8, eggs 7, larvae 1-12, pupae 5-6. Both sexes fly readily in hot sunlight in June. Adults and crimson larvae may be beaten in dozens from dead branches of birch and less frequently from broom. Food unknown, but I suspect that it is minute fungi coating dead bark and leaves.

H. parvulus (Bagnall). In 1927 Bagnall described *Phlœothrips parvulus* sp. n. for a male found in France. I have found no record of the species from the British Isles, and I assume that this is the species placed (without the year of the erection of the sp.) under *Hoplandrothrips* in the list of Kloet and Hincks. As Bagnall did not describe the armature of the fore legs or of the cheeks, it is impossible to be sure of the genus, but as he placed the description between that of *Phlœothrips immanis* Bagn. and *Hoplandrothrips ellisi* Bagn., and as I found in Aberdeenshire a male to which his description applies closely, I place the species in *Hoplandrothrips*. However, I consider my specimen to be *H. ellisi* Bagn., in which the fore legs are not strongly formed and the femoral and tibial teeth are undeveloped. The following account is based on Bagnall's description: Male, about 1.45 mm. long, dark chestnut brown, tube paler apically; femora grey-brown, paler than body; fore tibia yellowish-brown, paler distally; middle and hind tibiae brown, pale near base and pale yellow at apex; tarsi yellow; antennae, I, II, VIII brown, III-VI yellow at base, VII pale brown at base; wings hyaline with faint yellow tinge medianly; forewing has 7 accessory cilia. Crimson subcuticular pigment. Antennal segment III 62 (35), IV 60 (34), V 52.5 (27).

H. ellisi Bagnall (=*tridens* Priesner, syn. n.). Both sexes dark brown; antennal segments III-V or VI or VI-VII yellow in basal portion, III the most yellow and the others with progressively smaller portions of yellow; III scarcely longer than IV, 1.5-1.7 as long as II; both sexes fore tibia yellow or more or less shaded brown till it may be yellow only at apex; tibia II-III yellow at base and apex or only at extreme apex; wings hyaline except for brown tinge near middle; forewing has 9-15 accessory cilia in either sex; tube paler at apex than base. In ♀♀, as in *Acanthothrips*, small wrinkles are bounded by the striae between the tubercles on the cheeks and these look like cornicles in optical section (fig. 31 A). Subcuticular pigment crimson. ♀♀ 2.6-3.4 (0.4-0.5), ♂♂ 2.2-3 (0.34-0.44).

Bagnall described the species from ♂♂, 1 ♀ aken by beating dead branches, etc., at Balsall Common, Warwickshire, September 1913. He said 1 ♀, Kirklington Park, Oxon, 21.9.13, is apparently referable to this species, which he has also recorded from France. Priesner decribed the species as *tridens* and recorded it from Holland, Austria and Hungary, occurring throughout the year under dead bark of many species of trees. I found 14 ♀♀, 9 ♂♂, 46 II under bark of dead branches of *Sarothamnus scoparius* at Nairn during September 1945, and 1 ♂ under bark of the same species of plant in Aberdeenshire in April, and 1 ♂ under bark of a rotting log of *Pinus sylvestris* in Aberdeenshire, 19.6.46. The last male I have described in the key as probably *parvulus* as it conforms to Bagnall's description.

I suspect that *ellisi*, *collinsi* and *parvulus* are synonyms of *bidens* Bagn., for the three major characters taken by Bagnall for the separation of the species are variable enough in my *ellisi* to cover Bagnall's descriptions of the four species. The chief characters taken by Bagnall are: (1) colouration of the tibiae, but this is variable in both sexes, (2) teeth on fore femur and tibia, but these may be present or absent within the species (cf. the N. American *H. virago* Hood, 1931), (3) the comparative lengths of the three bristles at the base of the forewing, but of these II is often the longest in the ♂, III in the ♀.

H. collinsi Bagnall. Male, according to Bagnall colouration almost as in *ellisi*; 1.5 mm.

Bagnall recorded 1 ♂ with *ellisi* on dead branches, etc., Balsall Common, Warwickshire, 1 ♂ dead ash branches, Enslow Bridge, Oxfordshire, September 1913.

H. bidens (Bagnall). Male 1.85 (0.36), yellowish-brown; all tarsi yellow; fore tibiae yellow shaded with brown; wing colouration not described; antennal segments I, II, VII, VIII brown, III-VI yellow at base; III, IV equal in length and about 1.4 as long as II; III laterally emarginate within. Bagnall recorded a ♂ from oak at Bookham, Surrey, May 1926. He described the species from a ♂ (apparently carded) in the Hungarian Museum, and he recorded several ♀♀ and a ♂ from France, but he did not describe the ♀♀, and all published measurements are of only a few of the bristles of a male.

Acanthothrips Uzel.

Mouthcone pointed; cheeks with numerous large warts, each bearing a small bristle directed forwards; these bristles about equal in size; cuticle of head marked with strong confluent striae. Fore femur enlarged in both sexes and bearing a strong dark tooth before the apex; fore tarsus with strong tooth; wings not constricted in middle; abdominal tergites III-VIII with a white spot at each fore angle. Bristles with tips expanded. Antennal segments III with 3 and IV with 3 sense cones.

Type species *nodicornis* (Reuter).

A. nodicornis (Reuter). Dark brown; antennal segment III yellow, shaded brown at apex, IV-V brownish-yellow at base and apex, VI coloured like V or dark at apex; fore tibia brownish-yellow, darker brown in middle; mid and hind tibiae yellow at base and apex; tarsi brownish-yellow; both sexes macropterous; wings more or less dark yellowish-grey with 28-44 accessory cilia on forewing; abdominal segments III-VIII with a white spot at each fore angle; abdominal bristles hyaline, expanded at tips; subcuticular pigment crimson. ♀♀ 2.4-4, ♂♂ 2.1-3.

Occurs under dead bark. Food unknown. Oxford, Surrey. Not found by me but I record larvae found by C. B. Williams in Herts.

Megathrips Targioni-Tozzetti.

Head (fig. 32) nearly twice as long as wide, almost twice length of mouthcone, little longer than pronotum and little shorter than tube, somewhat extended in front of eyes, with cheeks almost parallel, but slightly constricted just behind eyes and near base. Each cheek marked with anastomising, transverse striae and bearing about 12 short bristles with stumpy tips. Eyes slightly projecting, about 0.33 length of head, separated by little more than the width of an eye. Ocelli about equidistant from one another, set on a slight elevation of the head and the anterior ocellus just in front of the fore margins of the eyes. Interocellar bristle little more than half the length of an eye, little longer than postocellar and about equal to a pair on the dorsal surface near the middle of the head; postocular bristle at the side of the head is about half length of interocellar. Antennae set in front of eyes on shortly produced vertex of head, 8-segmented, nearly twice length of head; III longer than IV or V and about 4.5 as long as broad, with 2 and IV with 3 sense cones. Prothorax including fore coxae 2.7-2.3 times length of pronotum. Of anterior marginal bristles only inner pair developed 0.15, anterior midlateral 0.3, posterior midlateral 0.4, posteroangular 0.5-0.6, posteromarginal 0.5 length of pronotum. All bristles stout, brownish-yellow, with hyaline tip slightly expanded, rounded and dorsoventrally flattened (fig. 32). Pterothorax broader than prothorax. Legs fairly slender, fore femur scarcely expanded; tarsus without ventral claw on first segment. Females macro- or micro-pterous, ♂♂ micropterous. Wings strap-shaped with 24-26 accessory cilia to forewing. Abdomen elongate oval tapering to apex, broadest at segment III where it is little broader than the pterothorax. Tube nearly 4 times as long as IX, slightly constricted in middle, about 4.5 as long as wide at base, which is about twice the width at apex; transversely striated and striae most conspicuous at sides near base; bearing about 28 hairs of which 6-7 are seen on either side. Body bristles rather short, tip flattened and rounded, including 2 dorsal pairs on IX. The ventrolateral pair on IX and the terminal on X are pointed 0.3-0.4 length of tube.

Male abdominal segment VI bears on either side a tubular process, VIII on either side a hook. Subcuticular pigment crimson.

Type species *lativentris* (Heeger).

Key to Species.

1. ♀, tube 4 times the length of abdominal segment IX; ♂ abdominal segment VI with a tubular process on either side, VIII with a hook on either side. Body bristles including the 2 dorsal pairs on IX have rounded and flattened tips (fig. 32) 2
Megathrips T.T.
♀, tube 5-6 times the length of abdominal segment IX; ♂ abdominal segment VI with a tubular process on either side, VIII lacks hook on either side. Body bristles ending abruptly in hyaline, pointed tips and those of IX tapering to point (fig. 28) 3
(*Megalothrips* Uzel)
bonannii Uzel
2. Head 1.6-1.8 as long as broad; all tibiae and tarsi and base and apex of femora yellow .... *lativentris* (Heeger)
Head quite twice as long as broad; legs dark brown with tarsi paler .... *nobilis* Bagnall
3. Head about twice as long as broad; legs dark brown with tarsi paler .... *bonannii* (Uzel)

M. lativentris (Heeger). (Fig. 32.) Dark chocolate-brown to almost black; antennal segment III yellow, shaded brown at apex, IV-V and in some specimens VI yellow in basal portion; legs yellow and brown; wings pale brownish-yellow; bristles brownish-yellow. Macropterous ♀ 4.5 (0.75), micropterous ♀ 4-4.5 (0.55-0.65), ♂♂ smaller.

Recorded as found throughout the year in Europe. Bagnall recorded from Cheshire, Edelsten from Berks and Dorset. I have found 1 ♀ macropterous, 18 ♀♀ micropterous 3-8, larvae 7-8, pupae 8 amongst dead leaves or on dead branches of oak and birch, either on dry or marshy ground. Food unknown. I suspect that the food is microscopic fungi and/or algae coating the dead branches and leaves. John says that the species is viviparous.

M. nobilis Bagnall. Dark brown body wth red subcuticular pigment; antennae coloured as in *lativentris*, but VI totally brown. Micropterous ♀♀ 4-5 (0.62), ♂♂ 3.5-3.8. Apparently the largest British Thysanopteron. Adults probably occur throughout the year on sedges and grass. Probably locally common. Food unknown. The only British records are the old one of ♀♀, ♂♂, larvae 3-5 in Cambridgeshire.

M. (*Megalothrips*) *bonannii* (Uzel). Dark brown to almost black. Subcuticular pigment red. Antennal segment III yellow, shaded dark brown at apex, IV-V yellow in basal portion; wings brownish-yellow with 23-33 accessory cilia on forewing; bristles yellowish-brown. shaped like those of *lativentris* but ending abruptly in hyaline, pointed tips. Macropterous ♀♀ 3.4-3.7 (0.57), ♂♂ smaller. The living, ovigerous ♀ with distended abdomen should exceed *lativentris* and equal *nobilis* in length, but the 4 living ♀♀ I saw in October were not as large as *lativentris*.

Mr H. M. Edelsten (1944, *Proc. R. Ent. Soc. Lond.*, 9, 1-2) found some larvae in a swelling on a sallow branch in August 1943 at Wood Walton Fen, Hunts, and after three of these emerged as adults they were identified as *M. bonannii* by Mr F. Laing, who also supplied Mr Edelsten with information on the distribution of British species of *Megathrips*. The insect appears to live in partly dead sallow branches which have been attacked by the larvae of the moth, *Aegeria formicaeformis* Esper, and the beetle, *Cryptorhynchus lapathi* L. Food unknown. Mr Edelsten told me that the insect seems fairly common on sallow in that district. He kindly sent me 4 living ♀♀ which, unfortunately, did not breed.

Bolothrips Priesner.

Head from anterior margin of eyes about as long as broad, projecting roundly in front of eyes for about 0.14 its length; equal to or little longer than pronotum; about twice as long as tube. Cheeks curved outwards, narrowest at base, broadest just behind eyes, marked with cross striae and each bearing 3-4 minute bristles. Eyes about 0.3 length of head, separated by nearly twice width of an eye, projecting somewhat and on the ventral surface of the head curving in towards the mouthcone (cf. fig. 33). Front ocellus just in front of the anterior margin of the eyes, much closer to the hind ocelli than these are to one another; ocelli usually present in apterous ♀♀, ♂♂. Postocular bristle directly against eye, about length of eye, hyaline. Mouthcone rounded at apex, about half length of head. Antennae twice as long as head, 8-segmented, III about 2.5 longer than wide, little longer than IV or V; III with 2, IV with 2 sense cones. Prothorax with fore coxae little broader than head; anteroangular, midlateral, posteromarginal and fore coxal bristles about 0.2, posteroangular 0.4 length of pronotum. Pterothorax little narrower than prothorax plus fore coxae in apterous individuals. Legs normal length, fore femur usually much enlarged in ♂, scarcely in ♀; fore tarsus armed with strong tooth in ♂, not so in ♀. Wings macropterous, micropterous or absent, strap-shaped; forewing has 6-12 accessory cilia. Abdomen elongate oval, broadest at IV, tapering to tube. Tube ♀ about 2, ♂ 1.7 as long as broad; base 2.5 broader than apex; sides marked with cross striae. Segment IX of ♂ extended like a scale over base of tube on ventral surface. Longest bristles of IX, X pointed, little shorter than tube. All body bristles tapering to a hyaline tip which is rounded and slightly flattened dorsoventrally.

Type species *bicolor* (Heeger). Not British.

Key to Species.

Eyes strongly curved in towards mouthcone on ventral side of head (fig. 33); antennal segments IV-V dark .... *dentipes* (Reuter)

Eyes slightly curved in towards mouthcone on ventral side of head; antennal segments IV-V yellow, at least at base ...... *icarus* (Uzel)

B. dentipes (Reuter). Dark brown; prothorax may be paler; antennal segment III nearly 3 times as long as wide, yellow, tinged brown at apex; apex of II and an area between the middle and base of IV paler; tarsi, fore tibia, and apex and base of other tibiae yellowish-brown. Head strongly constricted near base. Tube about as long as head and about twice as wide at base as at apex. Bristles pale brownish-yellow. Macropterous or apterous ♀♀, apterous ♂♂. Apterous ♀♀ 2.2-3 (0.44), ♂♂ smaller. Lives apparently on grass, *Carex*, *Juncus* and adults may be found throughout the year in Europe. Seems common locally in marshes, Cambs, Hunts, Sussex and Dublin, Eire.

B. icarus (Uzel). Dark brown; antennal segment III, apex of II, base IV-V yellow; legs yellow or more or less shaded brown dorsally towards base of femora and tibiae; III with 1-2, IV with 3 sense cones; wings hyaline; forewing has about 11 accessory cilia. In ♂ head, antenna and legs may be paler than in ♀. Bristles pale, greyish-yellow. Antennal segment III 2.3-2.6 as long as wide; head only slightly constricted near base; cheeks slightly curved outwards or almost parallel; tube little shorter than head, twice as wide at base as at apex. Macro- or a-pterous ♀♀ 2-2.5 (0.37), apterous ♂♂ 1.5-1.7 (0.35). Lives apparently on grass. Adults and larvae recorded as occurring throughout the year in Europe. Included here because listed in Kloet and Hincks, but I have found no valid record for Britain.

Liothrips Uzel.

Uzel (1895) described *Liothrips* g. n. to include *hradecensis* sp. n., *setinodis* Reuter (1880) and *setinodis* var. *pragensis* nov. As he did not designate a type species this should be *hradecensis*, the first fully described by him. He found only two species, 1 ♀ *hradecensis* and ♀♀ *pragensis*; his fig. 147, Taf. VII, is that of *pragensis* though labelled *setinodis*. *L. setinodis* Uzel exists only in words describing the ♀; it is Uzel's interpretation of Reuter's description. The most important character mentioned in Uzel's key and description for separating *hradecensis* and *setinodis* is the colouration of the antennae, and this varies too much in *hradecensis* to be adequate.

Priesner in 1925 rightly erected *pragensis* as a species easily separated from the others.

Reuter found in 1876 and described (1880) in some detail *Phlœothrips setinodis* sp. n. from two specimens (neither sex nor finding place stated), one from Muchalls near Aberdeen and the other from Dava, Morayshire. The types are lost according to Ahlberg. I suspect that they were so poorly mounted (cf. Priesner, 1930, *Deuts. ent. Zeitschr.*, p. 33) that the description could not be accurate in detail, but Reuter stated that antennal segments III-VII were yellow and VIII was brown, the chief character used by Uzel for distinguishing the species.

Because of the inadequacy of Reuter's description of *setinodis* based on 2 specimens (probably carded ♀♀) of a species with antennae varying in colouration, I consider that Uzel was mistaken in his separation of species and that *setinodis* Reuter = *hradecensis* Uzel 1895, Priesner 1927, 1928 (syn. n.) and I suspect that Reuter in 1899, though influenced by Reuter's monograph, used *setinodis* Reuter nec Uzel for recording the species from Finland.

Karny in 1910 described *Hoodia* g. n. *austriaca* sp. n. *Hoodia* is a synonym of *Liothrips*. I consider that *L. austriacus* Karny = *setinodis* Priesner 1927, nec Reuter 1880 (syn. n.).

Besides the reasons given above for the changes in synonymy, I find that the yellow colour of antennal segments III-VII in my *setinodis* occurs in some old individuals of both sexes; it is not due to the pale colours of youth. I have found the species numerous at Muchalls and around Dava and common in Britain. Also it has been recorded under various names from Britain. On the contrary, the only record of *austriacus* from Britain is from Suffolk, a carded ♀ called *setinodis* by Bagnall in 1933. Considering the years, 1922-48, I have spent hunting for thrips, the habitats I have searched and the large number of *setinodis* found by me in N.E. Scotland, it seems strange, allowing for the lapse in time, if Reuter found in 1876 two specimens of a different species during casual visits to my hunting grounds.

Liothrips Uzel.

Head (fig. 34) 1.4-1.5 longer than wide, nearly twice length of pronotum, scarcely longer than tube, only projecting in front of eyes as a narrow vertex between bases of antennae, with cheeks parallel, each bearing 5-8 minute bristles and marked with anastomosing transverse striae. Eyes 0.36-0.38 length of head, projecting slightly in front and separated by the width of an eye. Ocelli set on a small elevation of the head between the eyes; front ocellus in line with the anterior margin of the eyes and closer to the lateral ocelli than these are to one another. Postocular bristles little shorter than eye. Mouthcone pointed, reaching the mesosternum, about 0.6 length of head and a little longer than broad; labrum long, pointed, projecting beyond cone. Antennae about twice as long as head, 8-segmented, III-VI long and slender; III with 1 and VI with 2 sense cones. Prothorax including fore coxae 2.2-3 broader than length of pronotum; anterior marginal, anteroangular about 0.5, midlateral 0.8, posteromarginal 0.9 and posteroangular bristle about 1 length of pronotum. All bristles on head, thorax, abdomen and 3 on base of forewing end abruptly in hyaline tip (fig. 34). They are dark brown in older individuals, hyaline with a brown base in young. Pterothorax broader than prothorax and fore coxae. Legs long, slender; fore femur not expanded even in male; fore tarsi unarmed. Both sexes macropterous; wings strap-shaped, widest near base, narrowest near apex; forewing has 11-20 accessory cilia. Abdomen elongate oval, widest at III and tapering from there to tube, not or scarcely wider than pterothorax. Segment IX of ♂ bears the 3rd pair of bristles long and stiff. The longest bristles on IX, X taper to fine point and are about as long as the tube. Tube smooth except for some cross striae near base, tapering almost evenly from base to apex, nearly 3 times as long as broad; 1.6-1.8 wider at base than at apex. Subcuticular pigment orange.

Type species *setinodis* (Reuter) (*hradecensis* Uzel).

Key to Species.

Antennal segment I dark brown, II dark brown tinged yellow at apex and ventrally, III-V yellow or III yellow, IV-VI yellow tinged brown at apex, VII usually brown but may be yellow tinged brown at apex, VIII brown. Length (width) ♀ IV 128 (45), V 118 (40), VI 118 (40); ♂ IV 106-118 (38), V 100 (40), VI 90 (32). Postocular bristle 80-100 .... *setinodis* (Reuter) (*hradecensis* Uzel, Priesner)

Antennal segment I dark brown, II dark brown with yellow apex and ventral portion, III-VIII yellow with apex of VIII and of VII in some specimens, brown. ♀, ♂ IV 96 (34-40), V 90-96 (34), VI 84 (28-33). Postocular bristle 100-120 .... *austriacus* (Karny) (*setinodis* Priesner nec Reuter)

Antennal segment I-II, VII-VIII dark brown, III yellow, IV-VI yellow base, brown apex. ♀ IV 84 (44), V 73 (39), VI 73 (33), ♂ IV 70 (36), V 70 (34), VI 67 (33). Postocular bristle 100-120 .... *vaneeckei* Priesner

L. setinodis (Reuter) (*hradecensis* Uzel) (fig. 34). Dark brown; all tarsi, fore tibiae, apices of fore femora, bases of middle and hind tibiae yellow; apices of middle and hind tibiae paler brown. Forewing darker than hindwing, but each pale brown or almost hyaline with darker median band. ♀♀ 2.6-3.7 (0.5-0.7), ♂♂ 2.5-2.7 (0.4-0.5).

Both sexes 5-8, eggs 6-8, larvae 7-4, pupae 4-6. The species may occur as some hundreds of adults and/or larvae on, at least, the lower branches of a large *Ulmus glabra* (*montana*), which species is perhaps more favoured than the other species of elms. Eggs on lower surface of leaves of elm. Adults and larvae feed on leaves of elm, ash and birch. Yellow larvae hibernate gregariously under moss or bark on host or neighbouring trees. Altitudinal range for breeding in Scotland is from trees at sea level and with branches overhanging the sea to those at least 1000 ft. above sea and 30 miles inland. Berks, Bucks, Durham, Northumberland, Oxon, Sussex, Aberdeen, Banff, Inverness, Kincardine, Moray, Nairn, Ross, Sutherland, West Lothian.

L. austriacus (Karny) (*setinodis* Priesner nec Reuter). Through the kindness of Prof. Priesner I have a slide bearing 2 ♀♀, 2 ♂♂ of this species from Hungary. Colouration like *setinodis*. ♀♀ 2.9-3 (0.48-0.52), ♂♂ 2.3-2.5 (0.44). Larval hosts are possibly shrubs. Bagnall recorded a carded ♀ as *setinodis* from Suffolk.

*L. vaneeckei** (Priesner). Lily thrips. Colouration like *setinodis*, but the yellow is darker orange, the brown is more reddish and the wings a little darker and the fore tibiae tend to be shaded brown in middle. ♀♀ 2-2.5 (0.43-0.5), ♂♂ 2-2.2 (0.38). Breeds on certain species of lilies and has been imported with bulbs. Life-history described by Hodson (1935) and later by Americans. Bucks, London.

List of British Thysanoptera.

Only the more important synonyms of British species are mentioned. The Dendrothripinae are placed between the Heliothripinae and Chirothripinae as in the key to subfamilies, though by an error they were placed between the Sericothripinae and Thripinae in the descriptions of species. Of the 178 species of Thysanoptera described and listed as British I am uncertain of the validity of 24 species for reasons mentioned in the descriptions. Instead of 54 as previously stated, 72 species are recorded (marked *) from the London Area from a survey of literature and further collecting.

THYSANOPTERA Haliday 1836.
Sub-ord. Terebrantia Haliday 1836.
Super-fam. Æolothripoidea Hood 1915.
(fam. Coleoptrata Haliday 1836).
Fam. Melanthripidae Bagnall 1924.
Melanthrips Haliday 1836.
(Melanothrips Burmeister 1838).
Type sp. *fuscus** (Sulzer 1776).
(obesa Haliday 1836).
*gracilicornis** Maltbaek 1931.
(bisetosus Bagnall 1934).
harrisoni Bagnall 1930.

M. (*Dichropterothrips* Priesner 1936).
Type sp. *ficalbii** Buffa 1907.
(angusticeps Bagnall 1924).
(anglicus Priesner 1936).

Fam. Æolothripidae Uzel 1895.
Rhipidothrips Uzel 1895.
Type sp. *gratiosus** Uzel 1895.
uzelianus Bagnall 1934.
brunneus Williams 1913.

Æolothrips Haliday 1836.
(Pygaeolella Priesner, 1926, 1938).
Type sp. *albicinctus** Haliday 1836.
(albocinctus Amyot et Serville 1843).
ericae Bagnall 1920.
(nobilis Priesner 1921).
(nobilis var. mülleri Priesner 1920).

Æ. (*Coleothrips* Haliday 1836).
Type sp. *fasciatus** (Linnaeus 1758).
(intermedius Bagnall 1934).
*tenuicornis** Bagnall 1926
(anthyllidis Bagnall 1932).
(clavicornis Bagnall 1934).

*propinquus** Bagnall 1924.
(astutus Priesner 1926).
(astutus var. atricornis Maltbaek 1928).
*melaleucus** Haliday in Walker 1852.
(conjunctus Priesner 1914).
(annectans Hood 1916).
vittatus Haliday 1836.

Æ. (*Podaeolella* Priesner 1926).
Type sp. *versicolor* Uzel 1895.
(melaleucus Uzel 1895, nec Hal. 1852).
(tibialis Reuter 1899).
(tiliae Bagnall 1912).
(similis Priesner 1919).
(costalis Bagnall 1920).
(maculosus Bagnall 1920).

Super-fam. Thripoidea Hood 1915.
Fam. Thripidae Uzel 1895.
(Stenelytra Haliday 1836).
Heliothripinae Karny 1921.

Heliothrips Haliday 1836.
Type sp. *haemorrhoidalis** (Bouché 1833).
(adonidum Haliday 1836).
(haemorrhoidalis var. abdominalis Reuter 1891).

Hercinothrips Bagnall 1932.
Type sp. *bicinctus** (Bagnall 1919).
*femoralis** (Reuter 1891).

Helionothrips Bagnall 1932.
Type sp. (brunneipennis Bagnall 1915. Not British).
*errans** (Williams 1916).

Parthenothrips Uzel 1895.
Type sp. *dracaenae** (Heeger 1852).

Dendrothripinae Morison 1947.
Dendrothrips Uzel 1895.
Type sp. *ornatus* (Jablonowski 1894).
(tiliae Uzel 1895).
schillei Bagnall 1927.
*degeeri** Uzel 1895.

Monochaetella Priesner 1921.
Type sp. *saltatrix* (Uzel 1895).
peucedani Bagnall 1932.

Chirothripinae Karny 1921.
Chirothrips Haliday 1836.
Type sp. *manicatus** Haliday 1836.
(var. adustus Uzel 1895).
(similis Bagnall 1909).
molestus Priesner 1926 sensu Hood 1938.
hamatus Trybom 1895.

Limothrips Haliday 1836.
Type sp. *denticornis** Haliday 1836.
incertis Bagnall 1926.
*cerealium** Haliday 1836.
(physapus Kirby 1796, nec Linn. 1758).
(avenae Hinds 1902).
(minor Bagnall 1927).
schmutzi Priesner 1919.
(cerealium Priesner 1914, nec Hal. 1836).

L. (*Pruthiella* Shumsher 1942).
Type sp. *angulicornis* (Jablonowski 1894).
(setariae Jones 1912).

Iridothrips Priesner 1940.
Type sp. *iridis* (Watson 1924).

Sericothripinae Karny 1921.
Sericothrips Haliday 1836.
Type sp. *staphylinus** Haliday 1836.
bicornis (Karny 1910).
(staphylinus Uzel 1895, nec Hal. 1836).
gracilicornis Williams 1916.
*longipennis** (Bagnall 1909).

Leucothrips Reuter 1904.
Type sp. *nigripennis* Reuter 1904.

Drepanothrips Uzel 1895.
Type sp. *reuteri* Uzel 1895.

Thripinae Karny 1921.
Aptinothrips Haliday 1836.
(Uzeliella Bagnall 1908).
Type sp. *rufus** (Gmelin 1788).
(lubbocki Bagnall 1908).
nitidulus Haliday 1836.
*stylifer** Trybom 1894.
elegans Priesner 1924.

Pseudoarticulella Shumsher 1942.
Type sp. *obscurus** (Müller 1776).
(striatus Osborn 1883).
badius (Williams 1913).
(var. pectens Bagnall 1923).

Anaphothrips Uzel 1895.
(Euthrips Targioni-Tozzetti 1886).
(Neophysopus Schmutz 1913).
Type sp. (ferrugineus Uzel 1895. Not British).
silvarum Priesner 1920.
_tamicola_* Bagnall 1914.
_orchidaceus_* Bagnall 1909.

Belothrips Haliday 1836.
Type sp. _acuminatus_ Haliday 1836.

Oxythrips Uzel 1895.
Type sp. _ajugae_* Uzel 1895.
(f. bicolor Uzel 1895).
(flavus Morison 1928).
pernicis Bagnall 1926.
brevistylis (Trybom 1895).
(hastata Uzel 1895).
quercicola Bagnall 1926.
_ulmifoliorum_* (Haliday 1836).
(ulmi Bagnall 1913).
halidayi Bagnall 1924.
virginalis Priesner 1920.
sp.
sp.

Odontothrips Amyot et Serville 1843.
Type sp. _phaleratus_* (Haliday 1836).
(anisomerus Bagnall 1924).
intermedius (Uzel 1895).
cytisi Morison 1928.
_ulicis_* (Haliday 1836).
uzeli Bagnall 1919.
(ulicis Uzel 1895, nec Hal. 1836).
_loti_* (Haliday in Walker 1852).
(ulicis Priesner 1920, nec Hal. 1836).
(anthyllidis Bagnall 1924).
quadrimanus Bagnall 1934.
thoracicus Bagnall 1934.
_meridionalis_* Priesner 1919.
(ignobilis Bagnall 1919).
(mutabilis Bagnall 1924).
inermis Bagnall 1928.

Taeniothrips Amyot et Serville 1843.
Type sp. _picipes_ (Zetterstedt 1828).
(primulae Haliday 1836).
(decora Haliday 1836).
_inconsequens_* (Uzel 1895).
(pyri Daniel 1904).
flavus (Bagnall 1928).

_atratus_* (Haliday 1836).
(britteni Bagnall 1914).
montanus Priesner 1921.
annulatus (Karny 1907).
trybomi (Karny 1908).
_vulgatissimus_* (Haliday 1836).
(pallipennis Uzel 1895).
pini (Uzel 1895).
inaequalis (Bagnall 1928).
friči (Uzel 1895).
(brevicornis Bagnall 1916).
(hispanicus Bagnall 1921).
salicis (Reuter 1878/9).
(ulmifoliorum Uzel 1895).
(consociatus Bagnall 1921).
latus (Bagnall 1912, 1929).
_propinquus_* (Bagnall 1921, 1929).
(latus Williams 1916, Priesner 1927, Morison 1929, Steinweden 1933).

_T._ (_Rhopalandrothrips_ Priesner 1922).
Type sp. _consociatus_* Targioni-Tozzetti 1886.
(obscurus Uzel 1895).

_T._ (_Amblythrips_ Bagnall 1911).
Type sp. _ericae_* (Haliday 1836).
(parviceps Uzel 1895).
(brevicollis Bagnall 1911).
(ericae Bagnall 1911).

Chaetanaphothrips Priesner 1925.
Type sp. _orchidii_ (Moulton 1907).

Thrips Linnaeus 1758.
(Bagnallia Bagnall 1913, nec Karny 1910).
Type sp. _physapus_* Linnaeus 1758.
(physopa Uzel 1895).
_praetermissus_* Priesner 1920.
(? montivagus Priesner 1923).
(? pillichi Priesner 1924).
_validus_* Uzel 1895.
_calcaratus_* Uzel 1895.
_fuscipennis_* Haliday 1836.
(tabaci Priesner 1927 partim, nec Lindeman 1888).
_major_* Uzel 1895.
(fuscipennis Priesner 1927 partim, nec Uzel 1895).
difficilis Priesner 1920.
junipericola n.n. Morison 1947, for _juniperina_ Bagnall 1909, nec Linnaeus 1758.

*sambuci** Heeger 1854.
(nigra Williams 1916).
viminalis Uzel 1895.
(salicarius Uzel 1895 partim).
menyanthidis Bagnall 1923.
euphorbiae Knechtel 1922/3.
(crassicornis Bagnall 1923).
*fulvipes** Bagnall 1923.
paludosus Bagnall 1913.
*biformis** Bagnall 1913.
(var. *adustus*, var. *melanurus* Bagn. 1913).
dilatatus Uzel 1895.
funebris Bagnall 1924.
klapaleki Uzel 1895.
paluster Reuter 1899.
discolor Haliday 1836.
(pallens Haliday 1836).
hawaiiensis Morgan 1913.
(albipes Bagnall 1914).
*tabaci** Lindeman 1888.
(minutissima Ruricola (Curtis) 1846, nec Linn. 1758).
(dorsalis Bagnall 1927).
*angusticeps** Uzel 1895.
(asemus Williams 1913).
minutissimus Linnaeus 1758.
(adamsoni Bagnall 1923).
albopilosus Uzel 1895.
frankeniae Bagnall 1926.
debilis Bagnall 1923.
*flavus** Schrank 1781.
(urticae Gmelin in Linnaeus 1788, nec Fabricius 1781).
alni Uzel 1895.
*nigropilosus** Uzel 1895.
*urticae** Fabricius 1781.
*origani** Priesner 1926.
(dyssochaetus Bagnall 1927).
euphorbiicola Bagnall 1924.
(euphorbiae Bagnall 1924, nec Knechtel 1922/3).

Stenothrips Uzel 1895.
(Bagnallia Karny 1910).
Type sp. *graminum** Uzel 1895.

Baliothrips Uzel 1895.
Type sp. *dispar** (Haliday 1836).
(brevicornis Haliday 1836).

(agnessae Bagnall 1911).
(halidayi Bagnall 1911).
exilis Bagnall 1928.

Platythrips Uzel 1895.
Type sp. *tunicatus** (Haliday in Walker 1852)
(nigricornis Bagnall 1913).

Bolacothrips Uzel 1895.
Type sp. *jordani* Uzel 1895.

Tmetothrips Amyot et Serville 1843.
(Pachythrips Uzel 1895).
Type sp. *subapterus* (Haliday 1836).

Frankliniella Karny 1910.
(Physapus Leach 1815, nec Sulzer 1761).
Type sp. *intonsa** (Trybom 1895).
(vulgatissima Heeger 1852, Uzel 1895, nec Haliday 1836).
(breviceps Bagnall 1911).
(var. maritima Priesner 1927).
anglicana Bagnall 1926.
*tenuicornis** (Uzel 1895).

Parafrankliniella Priesner 1920.
Type sp. *verbasci** Priesner 1920.

Kakothrips Williams 1914.
Type sp. *robustus** (Uzel 1895).
(pisivora Westwood 1880).

Scolothrips Hinds 1902.
Type sp. (sexmaculatus Pergande 1894. Not British)
longicornis Priesner 1925.
(sexmaculatus Priesner 1920, nec Pergande 1894).

Euchaetothrips Bagnall 1916.
Type sp. *kröli** (Schille 1910).
(ingens Priesner 1921).

Sub-ord. Tubulifera Haliday 1836.
Super-fam. Phlæothripoidea Hood 1915.
Fam. Phlæothripidae Uzel 1895.

Cryptothrips Uzel 1895.
Type sp. *nigripes** (Reuter 1880).
(latus Uzel 1895).
(major Bagnall 1911).
(williamsi Bagnall 1933).
*flavipes** Reuter 1901.

Cephalothrips Uzel 1895.
Type sp. *monilicornis** (Reuter 1880).
Phlœothrips Haliday 1836.
(Hoplothrips Amyot et Serville 1843).
(Trichothrips Uzel 1895).
(Dolerothrips Bagnall 1910).
Type sp. *pedicularius** Haliday 1836.
(flavipes Haliday 1836).
(propinquus Bagnall 1910).
(britteni Bagnall 1926).
ulmi (Fabricius 1781).
fungi (Zetterstedt 1828, Richter 1928).
(pini Haliday 1837).
*corticis** (Degeer 1773).
(copiosus Uzel 1895).
flumenellus (Hood 1931).
polysticti sp. n.
caespitis (Uzel 1895).
semicaecus (Uzel 1895).
amabilis (Bagnall 1926).
longisetis (Bagnall 1910).
(caespitis Bagnall 1909, nec Uzel 1895).
(maderi Priesner 1924).

Haplothrips Amyot et Serville 1843.
(Anthothrips Uzel 1895).
Type sp. *aculeatus* (Fabricius 1803).
(albipennis Burmeister 1838).
(cephalotes Bagnall 1913).
*flavitibia** Williams 1916.
*subtilissimus** (Haliday 1852 in Walker).
(kourdjumovi Karny 1913).
(v. atricornis Priesner 1925).

H. (*Xylaplothrips* Priesner 1927).
Type sp. *fuliginosus* (Schille 1910).
(obscuripennis Bagnall 1913).
subterraneus Crawford 1938.
(liliorus Kurosawa 1938).

H. (*Zygothrips* Uzel 1895).
Type sp. *minutus* (Uzel 1895).

Haplothrips A. et S.
Type sp. *distinguendus** (Uzel 1895).
marrubiicola Bagnall 1932.
*juncorum** Bagnall 1913.
*juncicola** Bagnall 1932.
*setiger** Priesner 1924.
senecionis Bagnall 1932.

(distinguendus Bagnall 1924, nec Uzel 1895).
statices (Haliday 1836).
(morisoni Priesner 1928).
(armeriae Maltbaek 1931).
leucanthemi (Schrank 1781).
(statices Heeger 1852, nec Haliday 1836).
angusticornis Priesner 1921.
niger (Osborn 1883).
(trifolii Priesner 1919).

Neoheegeria Schmutz 1909.
Type sp. (dalmatica Schmutz 1909. Not British).
verbasci (Osborn 1896).

Euphlœothrips n. n. for Phlœothrips A. & S. 1843.
Type sp. *coriaceus* (Haliday 1836).
immanis (Bagnall 1927).

Hoplandrothrips Hood 1912.
Type sp. (xanthopus Hood. Not British).
annulipes (Reuter 1880).
parvulus (Bagnall 1927).
ellisi Bagnall 1914.
(tridens Priesner 1914).
collinsi Bagnall 1914.
bidens (Bagnall 1910).

Acanthothrips Uzel 1895.
Type sp. *nodicornis* (Reuter 1880).

Megathrips Targioni-Tozzetti 1881.
Type sp. *lativentris* (Heeger 1852).
nobilis Bagnall 1909.

M. (*Megalothrips* Uzel 1895).
Type sp. *bonannii* (Uzel 1895).

Bolothrips Priesner 1926.
Type sp. (bicolor Heeger 1852. Not British).
dentipes (Reuter 1880).
icarus (Uzel 1895).

Liothrips Uzel 1895.
(Hoodia Karny 1910).
Type sp. *setinodis* (Reuter 1880).
(hradecensis Uzel 1895, Priesner 1927).
(bagnalli Karny 1912).
austriacus (Karny 1910).
(setinodis Priesner 1927, nec Reuter 1880).
*vaneeckei** Priesner 1920.
(hradecensis Priesner 1920, nec Uzel 1895).

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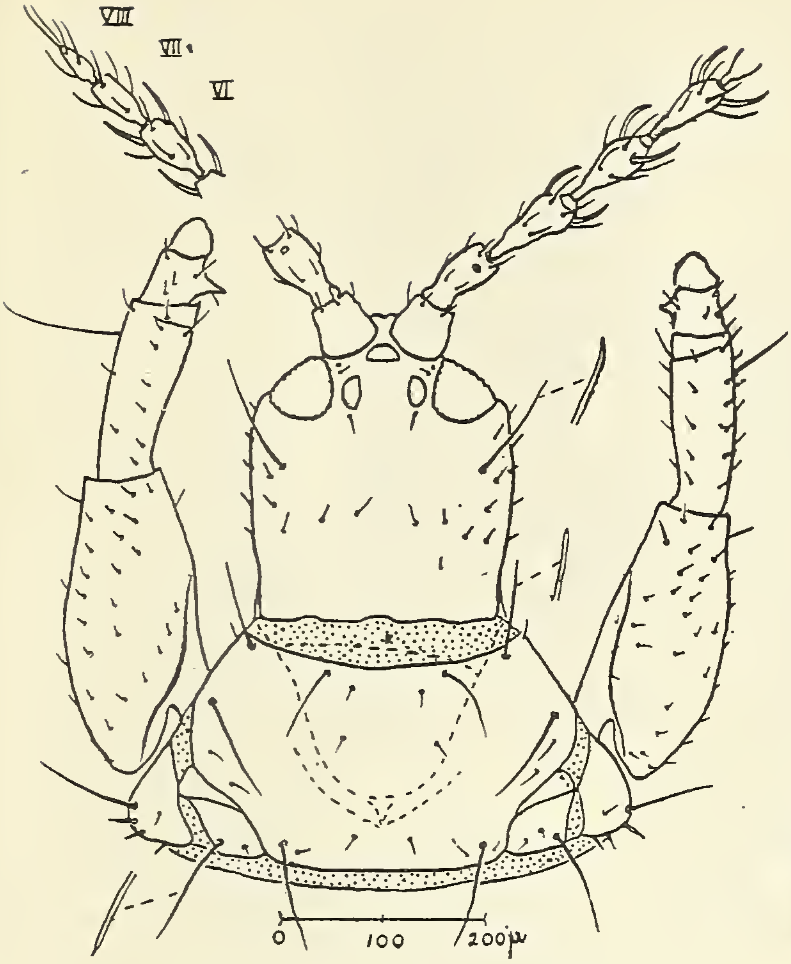

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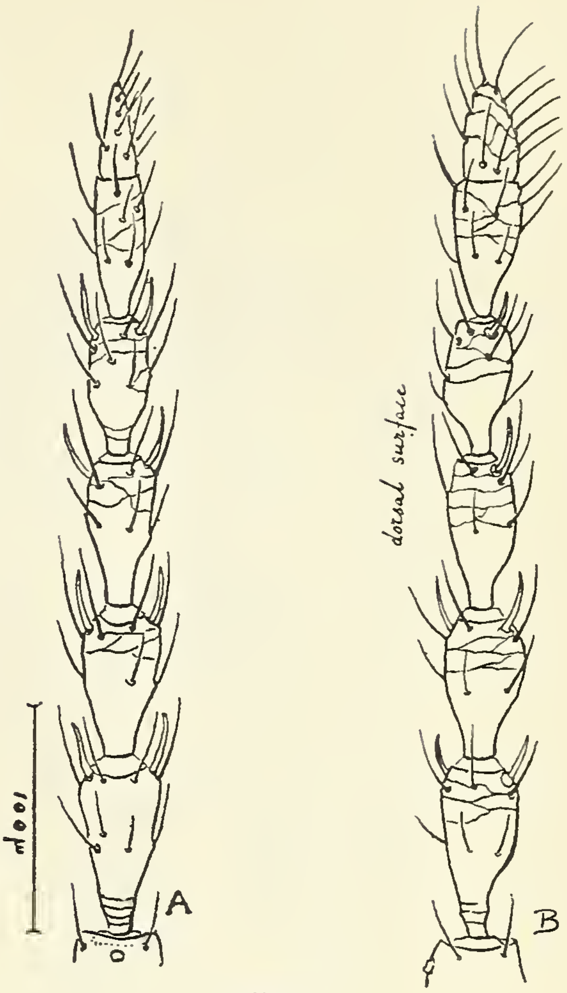

Fig. 24.

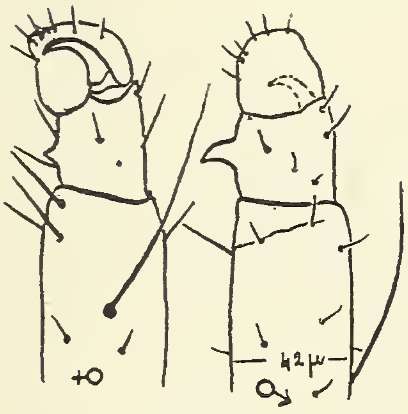

Fig. 25.

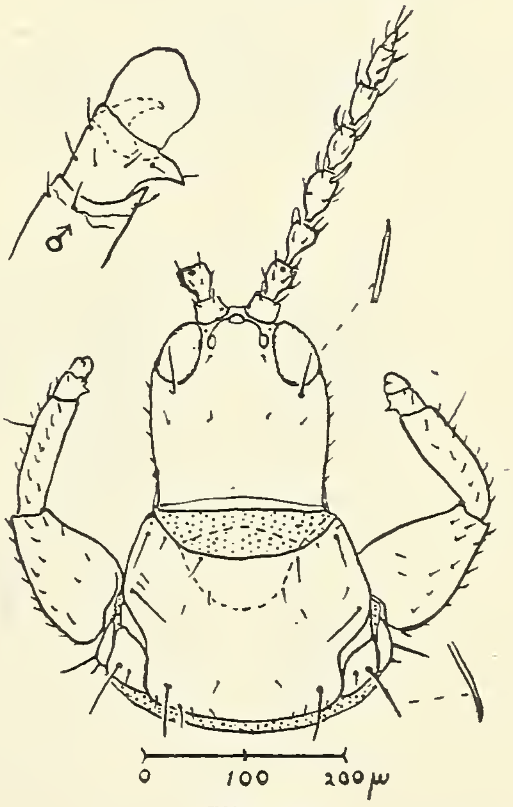

Fig. 26.

Fig. 23. *PHLAEOTHRIPS PEDICULARIUS* Hal. ♀ Macropterous.
Fig. 24. *PHLAEOTHRIPS LONGISETIS* (Bagn.). ♀ Left antenna segments III-VIII. A, dorsal. B, inner lateral view.
Fig. 25. *PHLAEOTHRIPS POLYSTICTI* sp. n. Fore tarsus left leg. ♀ macropterous, outer view. ♂ micropterous, inner view.
Fig. 26. *HAPLOTHRIPS ACULEATUS* (Fabr.). ♀ head and prothorax. ♂ left fore tarsus.

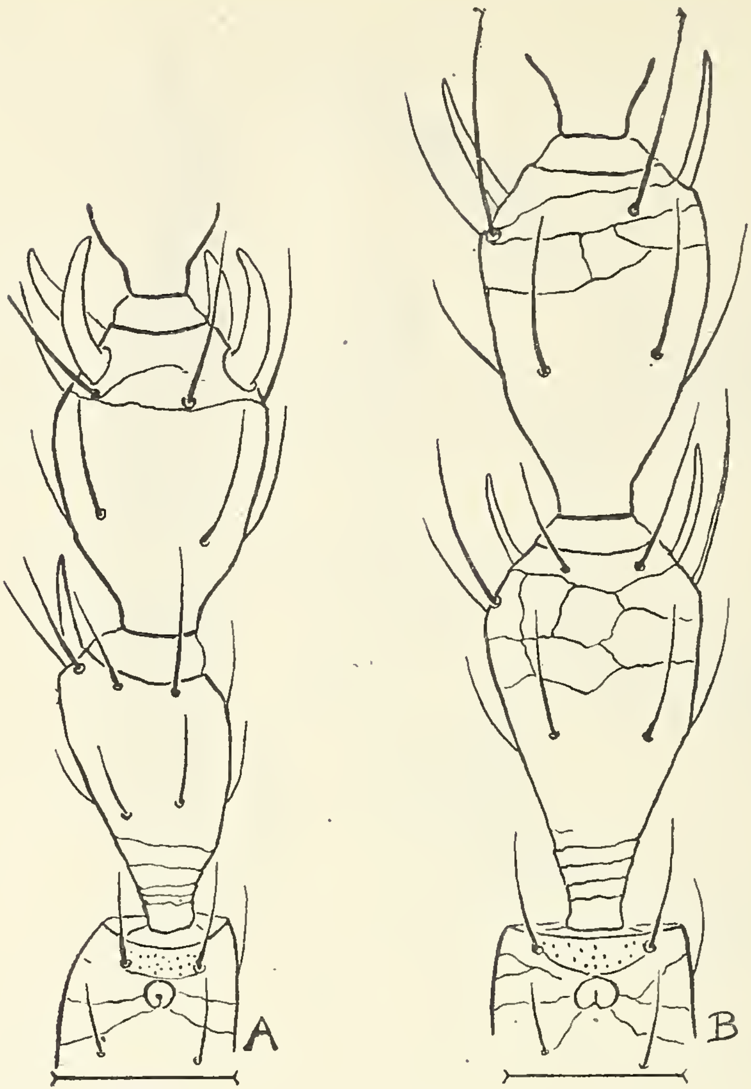

Fig. 27. A, *HAPLOTHRIPS ACULEATUS* (Fabr.). B, *H. FULIGINOSUS* (Schille). Left antennal segments III-IV dorsal view.

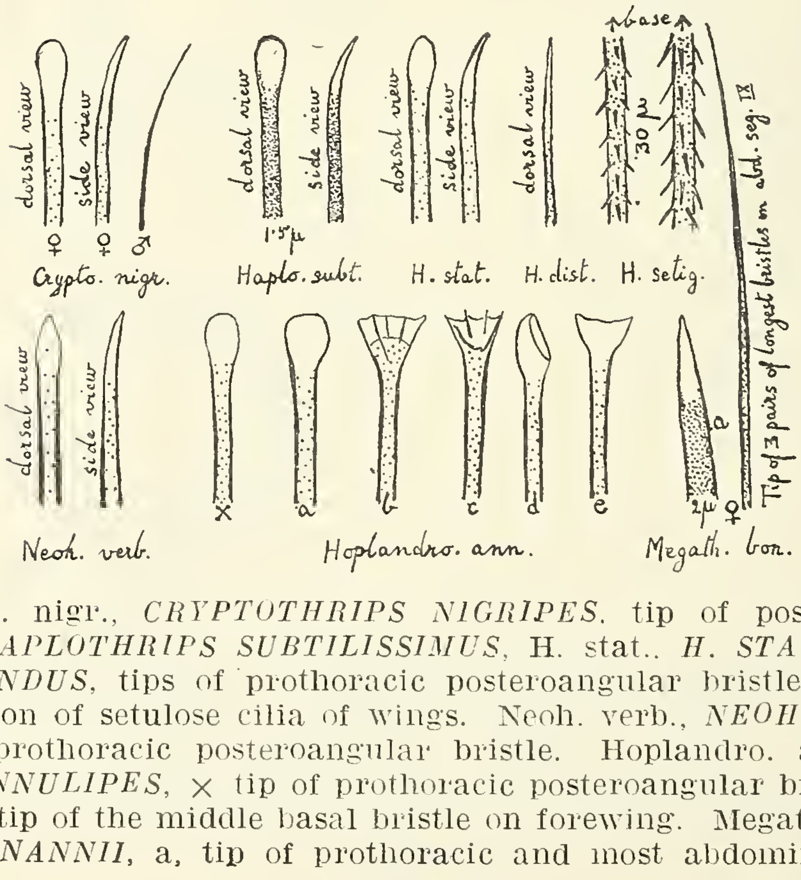

Fig. 28. Crypto. nigr., *CRYPTOTHRIPS NIGRIPES*, tip of postocular bristle. Haplo. subt., *HAPLOTHRIPS SUBTILISSIMUS*, H. stat., *H. STATICIS*, H. dist., *H. DISTINGUENDUS*, tips of prothoracic posteroangular bristle. H. setig., *H. SETIGER*, portion of setulose cilia of wings. Neoh. verb., *NEOHEEGERIA VERBASCI*, tip of prothoracic posteroangular bristle. Hoplandro. ann., *HOPLANDROTHRIPS ANNULIPES*, × tip of prothoracic posteroangular bristle, a-e modifications of the tip of the middle basal bristle on forewing. Megath. bon., *MEGATHRIPS BONANNII*, a, tip of prothoracic and most abdominal bristles.

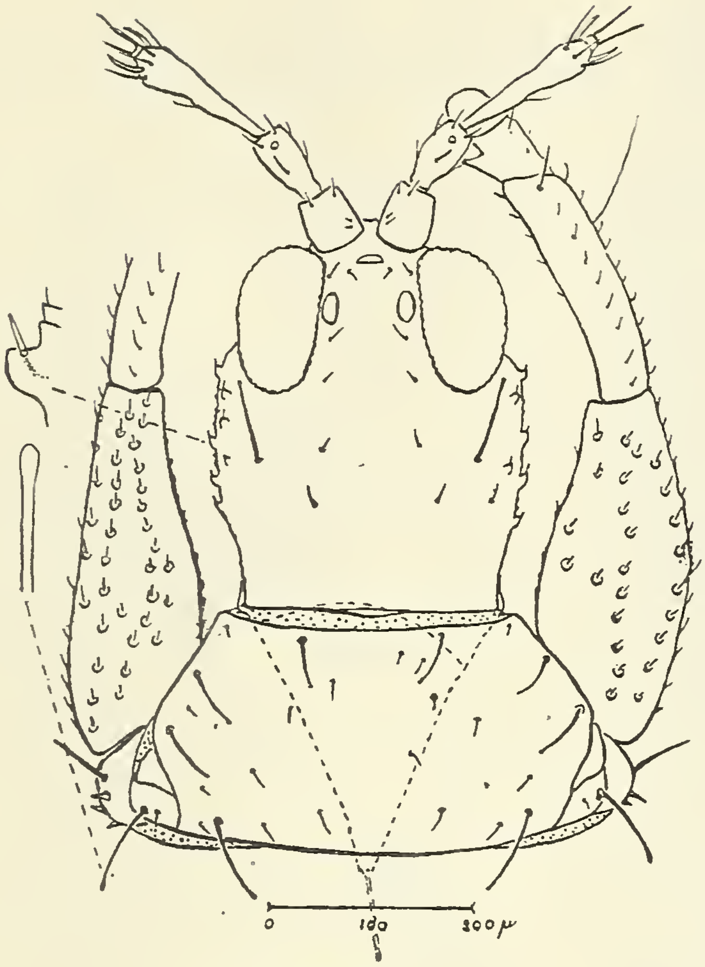

Fig. 29.

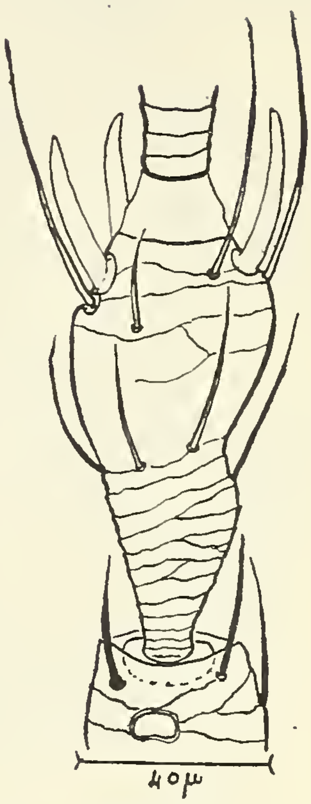

Fig. 30.

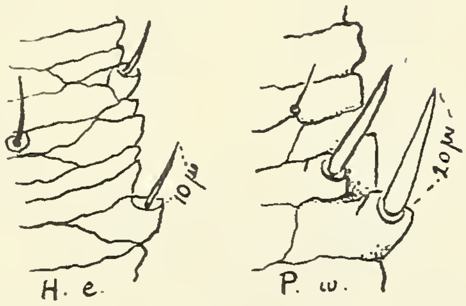

Fig. 31.

Fig. 29. *EUPHLAEOTHRIPS CORIACEUS* (Hal.). ♀ head and prothorax. Striation not depicted.

Fig. 30. *HOPLANDROTHRIPS ELLISI* Bagn. ♀ left antennal segment III, dorsal view.

Fig. 31. *HOPLANDROTHRIPS ELLISI* Bagn., H. e. *PHLAEOTHRIPS ULMI* (Fabr.), P. w. Dorsal profile of middle of right cheek of male.

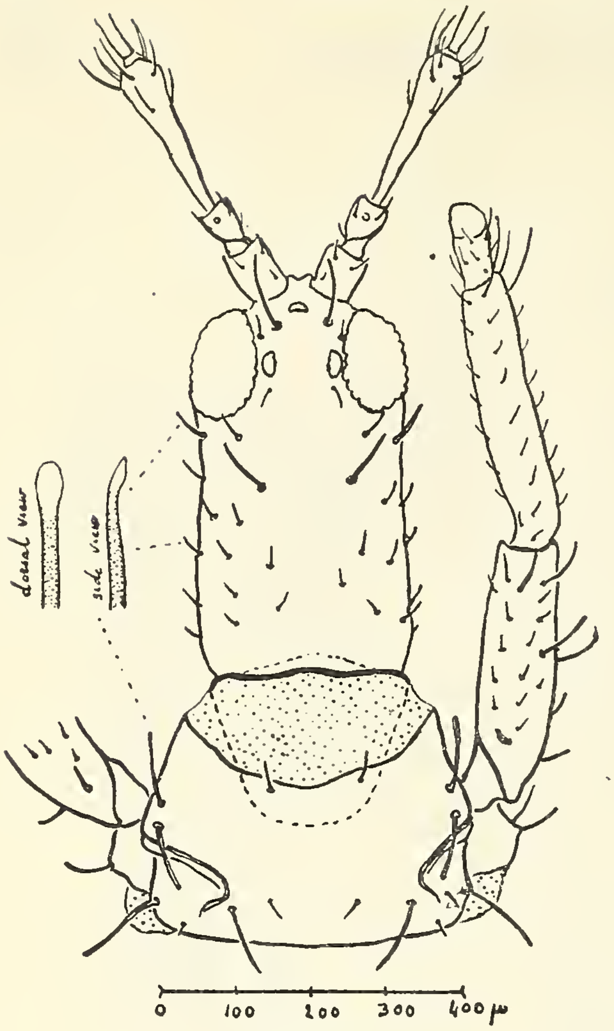

Fig. 32.

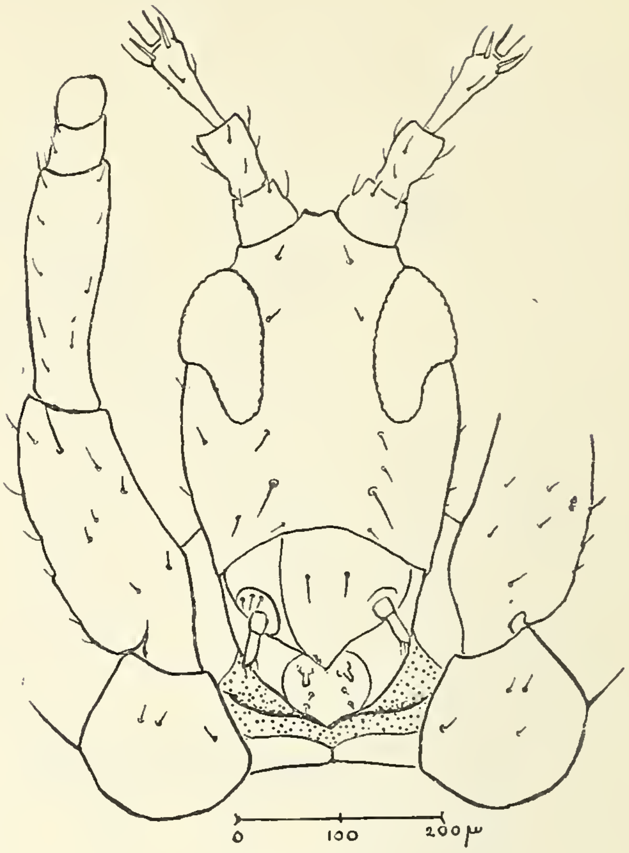

Fig. 33.

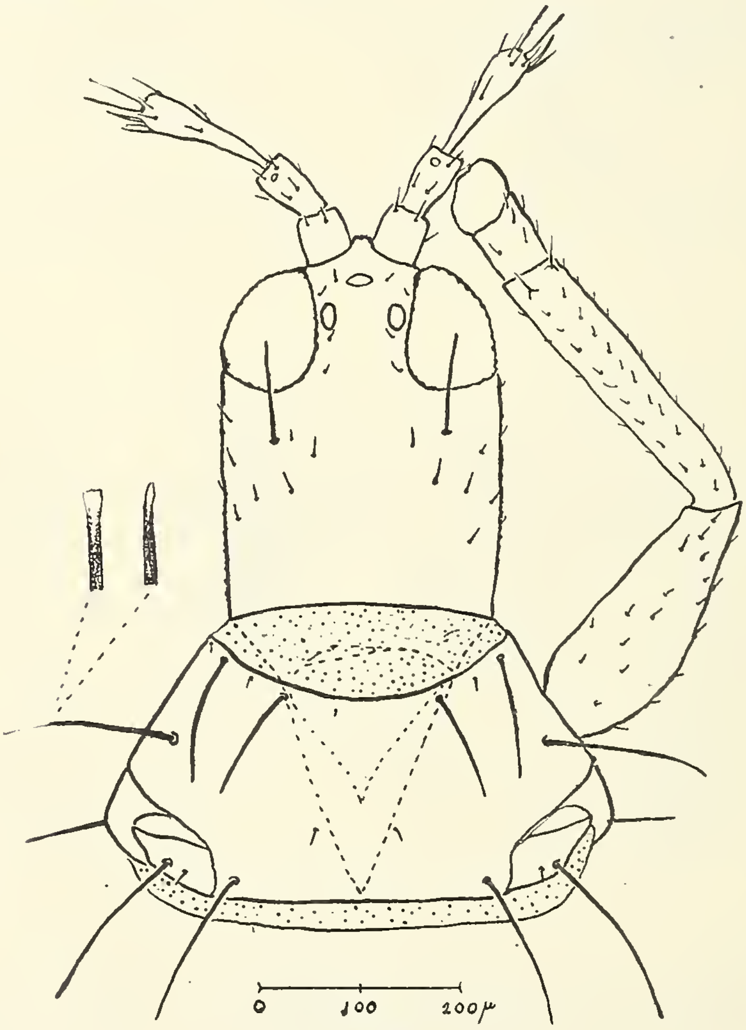

Fig. 34.

Fig. 32. *MEGATHRIPS LATIVENTRIS* (Heeger). ♀ micropterous. Head and prothorax.

Fig. 33. *BOLOTHRIPS DENTIPES* (Heeger). ♀ apterous. Ventral view of head and prothorax.

Fig. 34. *LIOTHRIPS SETINODIS* (Reuter). ♀ head and prothorax.

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